BACHELOR THESIS - ME141501

ENVIRONMENTAL RISK ASSESSMENT OF COAL LOADING IN LUBUK TUTUNG KALIMANTAN TIMUR COAL TERMINAL

FAISHAL RACHMAN
NRP 4212 100 137

Supervisor
A.A.B. Dinariyana D.P., S.T., MES., Ph.D.
Dr. Kriyo Sambodho, S.T., M.Eng.

DEPARTMENT OF MARINE ENGINEERING
Faculty of Marine Technology
Institut Teknologi Sepuluh Nopember
Surabaya 2017

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SKRIPSI - ME141501

ANALISA RISIKO LINGKUNGAN DARI PEMUATAN BATUBARA DI TERMINAL BATUBARA LUBUK TUTUNG KALIMANTAN TIMUR

FAISHAL RACHMAN
NRP 4212 100 137

Dosen Pembimbing
A.A.B. Dinariyana D.P., S.T., MES., Ph.D.
Dr. Kriyo Sambodho, S.T., M.Eng.

DEPARTEMEN TEKNIK SISTEM PERKAPALAN
Fakultas Teknologi Kelautan
Institut Teknologi Sepuluh Nopember
Surabaya 2017

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APPROVAL FORM

ENVIRONMENTAL RISK ASSESSMENT OF COAL LOADING IN LUBUK TUTUNG KALIMANTAN TIMUR COAL TERMINAL

BACHELOR THESIS
Submitted to Comply One of the Requirement to Obtain a Bachelor Engineering Degree on Reliability, Availability, Maintenance and Safety (RAMS) Laboratory S-1 Program
Department of Marine Engineering
Faculty of Marine Technology
Institut Teknologi Sepuluh Nopember

Prepared By:
FAISHAL RACHMAN
NRP 4212 100 137

Approved By Supervisor:
1. A.A.B. Dinariyana D.P., S.T., MES., Ph.D. ( )
2. Dr. Kriyo Sambodho, S.T., M.Eng. ( )

SURABAYA
JANUARY, 2017

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Prepared By:
FAISHAL RACHMAN
NRP 4212 100 137

Approved By
Head of Department of Marine Engineering:

KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
FAKULTAS TEKNOLOGI KELAUTAN
JURUSAN TEKNIK SISTEM PERKAPALAN

Dr. Eng. Muhammad Badrus Zaman, S.T., M.T.
NIP. 1977 0802 2008 01 1007

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Name	: Faishal Rachman
NRP	: 4212 100 137
Bachelor Thesis Title:	Environmental Risk Assessment of Coal Loading in Lubuk Tutung Kalimantan Timur Coal Terminal

Department: Marine Engineering

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Faishal Rachman

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ENVIRONMENTAL RISK ASSESSMENT OF COAL LOADING IN LUBUK TUTUNG KALIMANTAN TIMUR COAL TERMINAL

Name : Faishal Rachman
NRP : 4212 100 137
Department : Marine Engineering
Supervisor :

1. **A.A.B. Dinariyana D.P., S.T., MES., Ph.D.**
2. **Dr. Kriyo Sambodho, S.T., M.Eng.**

Abstract

Indonesian government has committed to build mega project power plant in 2015 – 2019 to provide 35.000 Megawatts (MW) for Indonesia. Many power plants would be built across Indonesia area. Some of power plants is coal – fuel power plant. Therefore, it is really necessary for Indonesia to have enough coal stock to supply power plants. Port plays a key role to maintain coal stock. Ships that carrying coal would perform loading and unloading process in port. Because the volume of coal that moved in a day is quite large, the potential of the danger incurred in the loading and process will getting bigger. Therefore, it is important to assess hazard around port when ship perform loading and unloading process.

Environmental risk assessment covering how big the possibility of collision, grounding, toxic release, fire and spilling accident that can cause casualties and environmental damage. The process of environmental risk assessment consisting of identification hazard by using hazard survey method, analysis possible causes of danger that would happen in facilities, then frequency analysis by using FTA (Fault Tree Analysis) method, and do a consequence of analysis simulations with vertical suspended – sediment distributions graphic. After it is done, will obtained the results of the risk assessment. Risk assessment level in the risk acceptance matrix based on the framework provided from KPC Risk Rank. The accidents mainly caused by human error, rough environment and equipments failure. Based on the frequency analysis, there are no accidents considered as high frequency level.

Based on the consequence analysis, it occurred varied results. The level of concequence are varied from low risk to high risk. Based on the risk analysis, there is one accident considered as high risk, the accident that considered as high risk is collision of barge with bulk carrier. Therefore, it is necessary to do the mitigation. The mitigation based on DNV (Det Norske Veritas) mitigation strategies.

Keywords: Accidents, Coal Loading Process, Environmental Risk Assessment, Mitigation.

ANALISA RISIKO LINGKUNGAN DARI PEMUATAN BATUBARA DI TERMINAL BATUBARA LUBUK TUTUNG KALIMANTAN TIMUR

Nama : Faishal Rachman
NRP : 4212 100 137
Departemen : Teknik Sistem Perkapalan
Dosen Pembimbing :
1. A.A.B. Dinariyana D.P., S.T., MES., Ph.D.
2. Dr. Kriyo Sambodho, S.T., M.Eng.

Abstrak

Pemerintah Indonesia telah berkomitmen untuk membangun *mega project power plant* pada 2015 – 2019 dengan tujuan menyediakan 35.000 Megawatts (MW) untuk Indonesia. Banyak *power plant* yang akan dibangun sepanjang wilayah Indonesia. Maka dari itu, sangat penting bagi Indonesia untuk mempunyai ketersediaan batubara untuk menyuplai *power plant*. Pelabuhan memainkan peranan penting pada ketersediaan batubara. Kapal – kapal yang mengangkut batubara akan melakukan proses pemuatan dan pembongkaran di pelabuhan. Karena jumlah dari batubara yang berpindah dalam sehari cukup besar, potensi bahaya yang timbul dari pemuatan batubara akan semakin besar. Maka dari itu, penting untuk menganalisa bahaya di sekitar pelabuhan ketika melakukan proses pemuatan dan pembongkaran.

Analisa risiko lingkungan mencakup seberapa besar kemungkinan kecelakaan tubrukan, kandas, *toxic release*, api dan tumpahan yang dapat menyebabkan kerusakan. Tahapan Analisa risiko lingkungan meliputi *hazard survey*, analisa kemungkinan penyebab bahaya yang terjadi di fasilitas, kemudian analisa frekuensi menggunakan metoda FTA *(fault tree analysis)*, dan melakukan analisa simulasi konsekuensi dengan *vertical sediment distributions graphic.* Setelah itu dilakukan, akan didapatkan hasil dari analisa risiko. Tingkat penilaian risiko pada *risk acceptance matrix* berdasarkan pada *matrix* yang telah diberikan dari KPC Risk Rank. Penyebab utama kejadian disebabkan oleh *human error*, lingkungan yang tidak kondusif dan kegagalan peralatan. Berdasarkan analisa frekuensi, tidak ada kecelakaan yang dianggap tingkat frekuensi tinggi.

Tingkat konsekuensi bervariasi, dari yang rendah sampai tinggi. Berdasarkan analisa risiko, ada satu kecelakaan yang dianggap risiko tinggi, yakni tubrukan tongkang dengan bulk carrier. Maka dari itu, penting untuk melakukan mitigasi. Mitigasi berdasarkan strategi mitigasi DNV *(Det Norske Veritas).*

Kata Kunci: Analisa Risiko Lingkungan, Batubara, Kecelakaan, Mitigasi.

PREFACE

Thanks to the presence of Allah SWT for everything that have given to me, which has given guidance so that the Bachelor Thesis with title "Environmental Risk Assessment of Coal Loading in Lubuk Tutung Coal Terminal" can be resolved properly. In completing this the Bachelor Thesis, I can't do it alone. Therefore, I would like to thank those who have helped in completing this Bachelor Thesis, among others:

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CHAPTER I
INTRODUCTION

1.1 Background

Indonesian government has committed to build mega project power plant in 2015 – 2019 to provide 35.000 Megawatts (MW) for Indonesia (Muchlis, 2013). Many power plants would be built across Indonesia area. Some of power plants is coal – fuel power plant. Therefore, it is really necessary for Indonesia to have enough coal stock to supply the power plants.

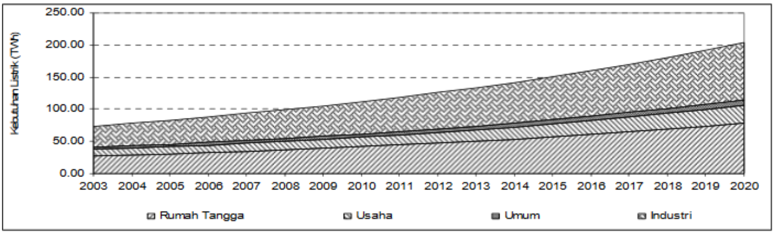

Figure 1.1 Projection of Electric Consumption in Java and Bali 2003 – 2020 (Source: Muchlis, 2013)

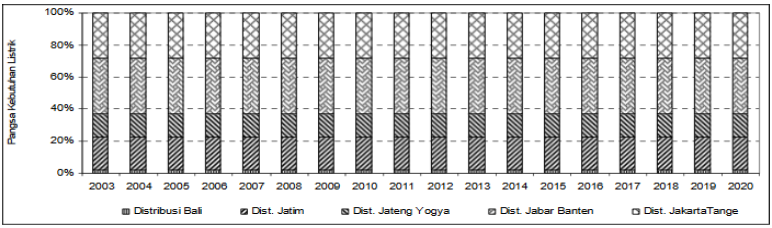

Figure 1.2 Projection of Electric Consumption in All Regions of Java and Bali 2003 – 2020 (Source: Muchlis, 2013)

PT. Dire Pratama as one of the coal handling company located in Kalimantan Timur plays significant role to supply coal across Indonesia area. This coal company have their own coal terminal to deliver its coal stock to another area in Indonesia.

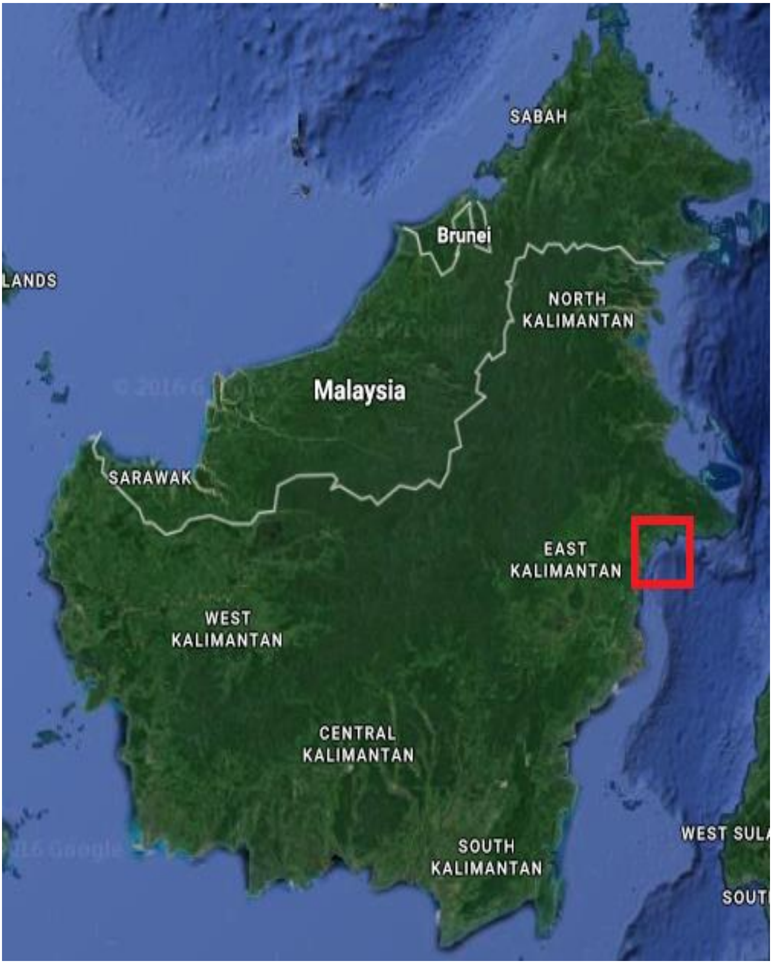

Figure 1.3 Map of Kalimantan (Source: Google Earth, 2016)

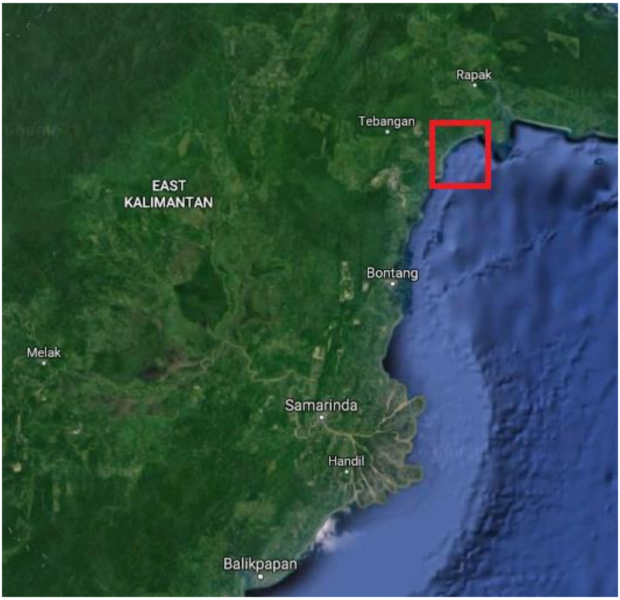

Figure 1.4 Map of Kalimantan Timur (Source: Google Earth, 2016)

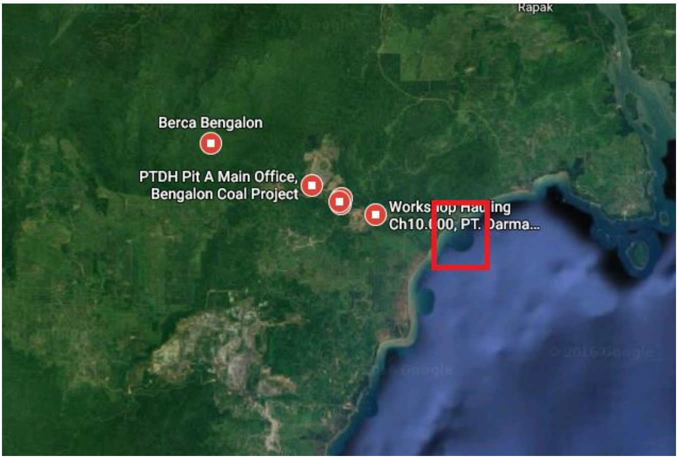

Figure 1.5 Map of Bengalon (Source: Google Earth, 2016)

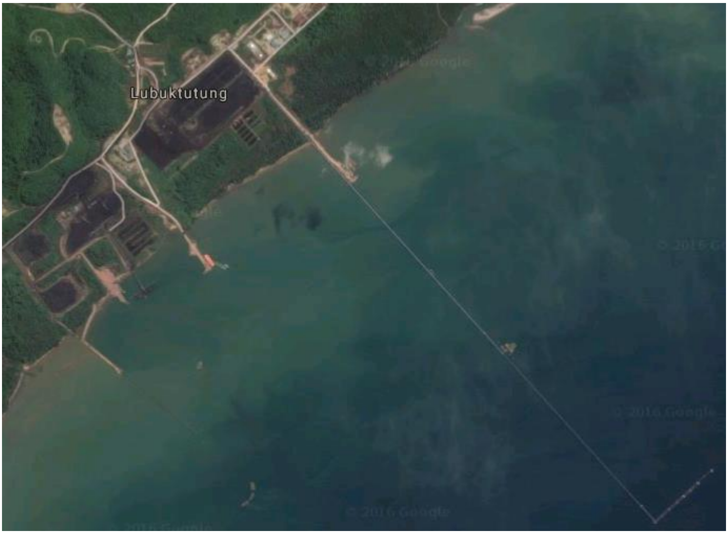

Figure 1.6 Map of PT. Dire Pratama Coal Terminal (Source: Google Earth, 2016)

One of the reasons of distribution coal in Indonesia is to satisfy the needs of power plants in Indonesia, furthermore it cannot be separated from PT. Dire Pratama coal terminal as one of the main gates for coal supply. Ships that will carrying coal from Kalimantan Timur region would perform loading process in PT. Dire Pratama coal terminal. Because the volume of coal that moved in a day is quite large, the potential of the danger incurred in the loading process will getting bigger. Furthermore, coal mine is considered as hazardous location (Class II, Division 2) because of the presence of combustible dust, according to National Electric Code from USA. A number of studies on risk analysis of coal operation in port had been done. As example for case study is environmental risk assessment of Newcastle coal export terminal in Australia, risk assessment study on coal barge operation in Fraser Survey Docks Canada. Risk assessment covering how big the possibility of collision, grounding, toxic release, fire and spilling accident that can cause casualties and environmental damage (Newcastle Coal Infrastructure Group, 2006).

The process of risk assessment consisting of identify hazard, analysis possible causes of danger that would happen in facilities, then frequency analysis, and do a consequence of analysis simulations with vertical suspended – sediment distributions graphic. After it is done, will obtained the results of the risk assessment. Risk assessment level in the risk acceptance matrix based on the framework provided from KPC Risk Rank. If the risk is unacceptable, then mitigation should be taken to reduce the risk that can cause casualties and environmental damage.

1.2 Problem Formulation and Scope

From the explanation above, so the main problem will be discussed is as follows:

a. How to identify hazard around coal terminal when ships perform loading process based on hazard survey?
b. What is the level frequency of risk that occurred at the coal loading process?
c. What is the level consequence of risk that occurred at the coal loading process?
d. How is the result of risk level in the risk acceptance matrix based on the framework provided from KPC Risk Rank?
e. How is mitigation recommendations (if necessary) based on DNV Risk Mitigation Strategies?

The stated scopes of this study are:

a. Analysis risk due to failure of the system.
b. The risk analysis relating to marine environmental.

1.3 Research Objectives

The objectives of this study are to:

a. Identify hazard around coal terminal when ships perform loading process based on Hazard Survey.
b. Analysis frequency of risk that occurred at coal loading process by using FTA (Fault Tree Analysis) method.
c. Analysis consequence of risk that occurred at coal loading process by using vertical suspended – sediment distributions graphic.
d. Be informed about the result of risk level in the risk acceptance matrix based on the framework provided from KPC Risk Rank.
e. Be informed about mitigation recommendations (if necessary) based on DNV Risk Mitigation Strategies.

1.4 Research Benefits

The benefits of this study are:

a. Could provide recommendations about the risk of coal loading process to PT. Dire Pratama Coal Terminal.
b. Could be used by the related parties to determine the act of prevention and mitigation for coal loading process.

CHAPTER II
BASIC THEORY

2.1 Theory

2.1.1 About PT. Dire Pratama Coal Terminal

PT. Dire Pratama coal terminal is one of the coal supplier in Kalimantan that plays significant role to maintain coal stock for Indonesia. One of its key advantages is that it has port link road. Among the facilities that it offers are a stockpile, conveyors, and a feeder breaker.

Figure 2.1 Location Map of PT. Dire Pratama Coal Terminal (Source: PT. Dire Pratama Coal Terminal, 2015)

Figure 2.2 Coal Terminal (Source: PT. Dire Pratama Coal Terminal, 2015)

2.1.2 Loading and Unloading of Bulk Carriers

The safety of bulk carriers at terminals in order to load or unload solid bulk cargoes, by reducing the risks of excessive stresses and physical damage to the ship's structure during loading or unloading, through the establishment of:

- Suitability requirements for those ships and terminals, and
- Procedures for co-operation and communication between those ships and terminals.

Schedule for Loading and Unloading of Bulk Carriers:

a. Requirements in relation to the operational suitability of bulk carriers for loading and unloading solid bulk cargoes
b. Requirements in relation to the suitability of terminals
c. Responsibilities of the master

d. Responsibilities of the terminal representative
e. Procedures between bulk carriers and terminals
f. Repair of damage incurred during loading and unloading
g. Role of competent authorities

Table 2.1 Recommendation Layout of Checklist (Source: Maritime and Coastguard Agency, 2003)

CHECKLIST TO SHOW THE SUITABILITY OF……………………………..* FOR LOADING AND UNLOADING SOLID BULK CARGOES (* name of ship)	
Cargo holds and hatch openings are suitable for cargo handling operations	
Cargo hold hatches, hatch operating systems and safety devices are in good functional order and used only for their intended purpose	
List indicating lights have been tested prior to arrival and are operational	
Loading instrument is certified and operational to carry out stress calculations during cargo handling operations	
Propulsion and auxiliary machinery is in good functional order	
Deck equipment for mooring and berthing operations is operable, in good order and condition	
Signed: (ship operator/ master (* please delete as appropriate))	Date

2.1.3 Environmental Assessment

The Port Marine Safety Code requires that all ports must base their management of marine operations (i.e. their powers, policies, plans and procedures) on a formal assessment of the hazards and risks to navigation within the port (Maritime Safety Authority of New Zealand, 2004). Furthermore, port authorities must maintain a formal navigational Safety Management System (SMS) developed from that risk assessment.

It is important therefore, that where there are particular marine operations, such as specialist one-off towage, vessel movements or new trades, which fall outside the scope of the Safety Management System (SMS), those operations are assessed to determine the likely risk to navigational safety. In addition to establish what, if any, additional or new risk control measures are required to reduce that risk to an acceptable level. The district Harbour Master will advise operators if any such operation or trade falls in that category. This study provides operators and owners with an overview of the environmental risk assessment.

The attitude to safety in Indonesia has evolved over recent decades from the reactive to the proactive. The Health and Safety Executive has promoted a common approach to safety across all the industries it regulates (Adnyana, 2012). In the past, safety regulation was introduced as the result of an accident or a series of accidents and tended to address the most obvious causes. However, over the years a number of defining incidents have altered the way in which safety is viewed.

Indonesia has now progressed to a risk based approach to commercial safety that aims to identify risks and control them, and to do this in a way that constantly updates the risks in any given process or operation. These principles can be applied readily to navigation in restricted tidal waters and rivers.

Safety is the business of all concerned, around which the entire operation must function. Involving crews and staff, and where necessary external advice, in the risk assessment; and utilising specialist knowledge and skills is essential, especially in the identification of hazards and the development or refinement of procedures and defences to mitigate those risks.

Definitions:

- Hazard is something that has the potential to cause harm.
- Risk is a combination of frequency of occurrence and consequence (outcome).

The risk assessment will typically involve five stages:

A. Data Gathering and Familiarisation
B. Hazard Identification
C. Risk Analysis
D. Risk Assessment
E. Risk Control

A. Data Gathering and Familiarisation

This initial stage has two main objectives: to become wholly familiar with the particular operation in question and also, where necessary; the organisation, its culture, policies, procedures, issues and priorities, and to assess the existing (vessel/organisational) safety management structure and identify any relevant hazards and risks (Maritime Safety Authority of New Zealand, 2004). The work should include, but not be limited to:

a. A review of current (and relevant) organisational and vessel management and operational procedures;
b. A thorough assessment of the operation(s) in question from a safety of navigation perspective;
c. Interviews with the vessel skipper, crew, management and where necessary contractors or principals;
d. Auditing of selected marine/navigational safety procedures;
e. A review of the requirements, limitations, and technical and contractual requirements of the operation/trade in question; and
f. A review of any relevant established incident database or similar records.

B. Hazard Identification (Hazard Survey)

This phase seeks to build on the work of Stage A and identify known hazards expected to be encountered because of the nature and/or area of the operation, and the existing risk control measures relating to those hazards. Equally importantly, it also seeks to identify any new hazards created as a result of the proposed service or operation. Structured Hazard Identification meetings (HAZIDs) should be held involving relevant marine staff, management, relevant customers or principals.

This approach recognises that the people best placed to identify hazards are often personnel working within the port, but that a "new pair of eyes" also notices items of significance that are accepted as normal in the system. The benefits provided by those outside pair of eyes are very important to the success of the risk assessment. It is perhaps obvious that risk assessments undertaken totally in-house do not generally address all the issues, some of which will be related to problems that the organisation with responsibility has hesitation in addressing (Anatec Ltd., 2012).

The HAZID process should be conducted on an Incident Category basis, across each area of the port. It should systematically consider vessel types, operations and interfaces appropriate to each area. The approach will be to undertake a general Hazard Identification on a geographical basis, followed by a number of smaller meetings concentrating on specific areas and assessment of specific operations. Hazards should be identified initially on a generic basis and then added, in order to consider scenarios specific to different areas of the port.

Identify the risks associated with port also could be based on information from the risk inventory

Table 2.2 Comparison of Hazard Identification methods (1)
(Source: Risk Management, 2015)

Method	Data Sources	Attributes	Application
Fault Tree Analysis	• Drawings • Equipment and Operation Specs • Maintenance Records	• Systematic • Identifies Combination Failures	• Decision Tool • Cause Analysis • Incident Investigation
Failure Modes, Effects and Critically Analysis	• Drawings • Operational Methods	• Systematic • Quantifies Risk • No Combination Failures	• Cause and Consequence Analysis • System Risk Assessment
Hazards and Operability Analysis	• PIDs • Installation Specifications • Operational Specifications	• Experience – Based • Identifies Combination Failures	• Analysis of Deviation from Design Intents • Risk Ranking
Hazard Survey	• Drawing Management Systems • Codes and Regulations	• Reduces Major Hazards • Quantifies Risk • No Combination Failures	• Equipment Audits • Safety Self Assessment
Process Safety Checklist	• Drawings • Equipment Specifications • Codes and Regulations	• Systematic • Not Stand – Alone • Qualitative	• Equipment Qualification • Shut – Down and Start – Up • Design Review
“What If?” Analysis	• Drawings • Procedures • Experience	• Non – Systematic • No Combination Failures	• Identification of Obvious Hazards • Design Review

Table 2.3 Comparison of Hazard Identification methods (2)
(Source: Risk Management, 2015)

Method	Application				
	Design Review	Incident Investigation	Change Control Management	Process Safety	Equipment Evaluation
Fault Tree Analysis		X	X		
FMEA	X		X	X	X
HAZOP	X			X	X
Hazard Survey	X	X			X
Process Safety Checklist				X	
"What If?" Analysis	X	X	X		X

C. Risk Analysis

Stage 3 introduces the concept of risk in a qualitative way in order to prioritise the hazards identified during Stage B and assess their impact on navigational safety. As shown above, risk is the combination of frequency and consequence. Prioritisation is an essential part of the process, as clearly, the greater the potential posed by a hazard, the greater the need to ensure that there are control measures, or defences, in place to mitigate that risk.

Sorting and ranking the HAZID output and adding the frequency component (i.e. how often such a hazard could happen – once a year, once every 10 years; 100 years 1000 years…) generates the risk profile. The frequency or likelihood of incidents can be established using professional advice, judgement or experience and, where appropriate, historical data identified in the first stage of the work. However, such historical information may not be available for new specialist trades or for one-off specialist operations. Normally, risks are assessed in four ways against a common frequency scale:

a. consequence to life;
b. consequence to the environment;
c. consequence to port authority operations; and
d. consequence to port users.

Such an approach not only assesses the impact of hazards on port safety, but also their impact on other important areas of the port infrastructure.

D. Risk Assessment

This process compares existing operations and procedures supported by relevant control measures with the new risk profile created by the introduction of the new trade or operation. It identifies gaps, which will require the introduction of new or enhanced risk control measures to reduce the level of risk to an acceptable level.

All activities entail an element of risk. A risk assessment can be defined as the determination of the quantitative or qualitative value of risk related to specific situations and hazards. In practical terms, a risk assessment is a thorough examination and identification of the situations and processes that may cause harm to people, environment, business and property.

Risk assessment in this study has aims to determine the level of risk that can be generated in the loading coal, by using FTA (Fault Tree Analysis).

Fault tree diagrams (or negative analytical trees) are logic block diagrams that display the state of a system (top event) in terms of the states of its components (basic events). Fault tree diagrams are a graphical design technique. An fault tree diagram is built top-down and in term of events rather than blocks. It uses a graphic "model" of the pathways within a system that can lead to a foreseeable, undesirable loss event (or a failure). The pathways connect contributory events and conditions, using standard logic symbols (AND, OR, etc.). The basic constructs in a fault tree diagram are gates and events.

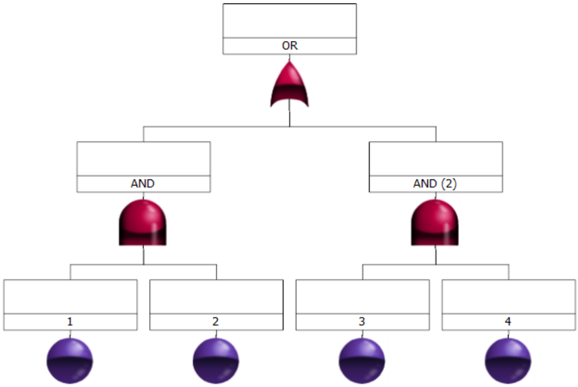

Figure 2.3 Fault Tree Diagram

Assess the potential risks from the following accident types:

a. Ship-ship collision: A contact between two or more vessels under way.
b. Powered grounding: Groundings that occur when the ship is under power and has the ability to navigate safely yet goes aground (e.g. due to human error).
c. Drift grounding: Groundings that occur when the ship is unable to navigate safely, usually due to mechanical failure and is forced on to the shoreline by the action of wind, current or waves.
d. Fire or explosion while a vessel is underway.

e. Structural failure or foundering while a vessel is underway.
f. Impact: An accident that typically occurs during approach or departure, when a ship impacts the berth with force sufficient to damage the ship or the berth.
g. Striking: A contact between a navigating ship and a ship moored at the berth.

A vertical suspended – sediment distributions graphic for assessing the risks of marine environment is used to assist with the PT. Dire Pratama coal terminal traffic assessment. The following natural environment data is used by the vertical suspended – sediment distributions graphic:

a. Visibility. This affects the collision and powered grounding accident models.
b. Wind speed and direction. This affects the drift grounding accident model if a water current is not applied.
c. Wave height (sea state). This affects the structural failure/ foundering accident model.
d. Sea bottom and coastal or river bank characterization. This affects the drift and powered grounding accident model.
e. Open water or river water. This affects the severity of the accident consequences for collision, powered and drift grounding and structural failure/ foundering accidents because such accidents are less likely to result in severe damage to the vessel in a sheltered river location compared to open water.
f. Currents.

Sediments play an important role in elemental cycling in the aquatic environment. It is responsible for transporting a significant proportion of many nutrients and contaminants. It also mediate their uptake, storage, release and transfer between environmental compartments. Most sediment in surface waters derives from surface erosion and comprises a mineral component, arising from the erosion of bedrock, and an organic component arising during soil-forming processes (United Nations Environment Programme, 1996). An additional organic component may be added by biological activity within the water body.

For the purposes of aquatic monitoring, sediment can be classified as deposited or suspended. Deposited sediment is that found on the bed of a river or lake. Suspended sediment is that found in the water column where it is being transported by water movements. Suspended sediment is also referred to as suspended matter, particulate matter or suspended solids (United Nations Environment Programme, 1996). Generally, the term suspended solids refer to mineral and organic solids, whereas suspended sediment should be restricted to the mineral fraction of the suspended solids load.

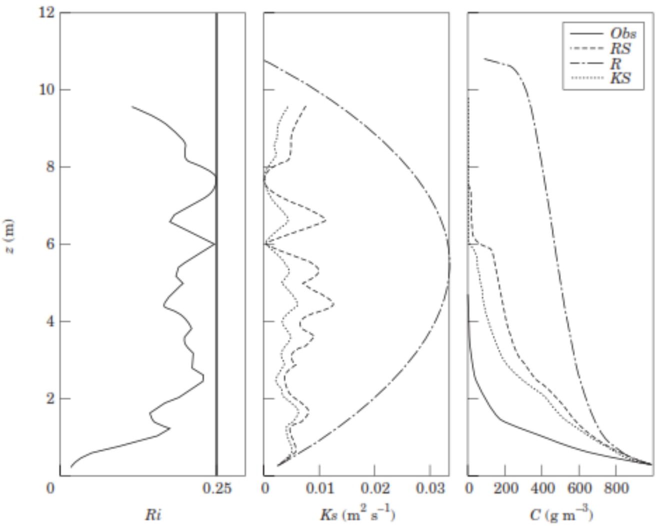

Figure 2.4 Example of Vertical Suspended – Sediment Distributions Graphic (Source: Philip Mark Orton, 2001)

Parameter that will be used for this graphic is Ministerial Decree of Indonesia's Ministry of Environment number 1 in 2010. This Ministerial Decree regulates water quality in coal business.

The risk analysis was used to evaluate the overall risks of these accidents. This step relied on a risk acceptance matrix. The risk acceptance matrix is developed based on the framework provided from KPC Risk Rank. The frequency of each accident was categorized from Many Times Per Year (A) to Unlikely in Life of Mine (E). Their consequence was assessed with regards to their potential impact to:

Environment: Refers to impacts to the quality of the water, air and ground as well as impacts to the wildlife and plants, in and around the river.

The consequences were then rated from Long-Term Impact (1) to Minor Impact (5).

	HEALTH CONSEQUENCES	SAFETY CONSEQUENCES	PROPERTY DAMAGE CONSEQUENCE	PRODUCTION CONSEQUENCE	ENVIRONMENTAL CONSEQUENCES
1	Long term chronic health effects to workers or public with potential for death	Fatality (Fatality, multiple fatality; major permanent disability)	Property Damage / >$ US 500k	More than 1week delay production	Large-scale, long-term environmental damage offsite and / or a compliance breach that threatens continued operation
2	Long term chronic health effects to workers or public with major impact on body function / lifestyle	LDI (Serious injury and hospitalization; permanent disability)	Property Damage / > $ US 100 – 500 K	3 – 6 day delay production	Large-scale, short-term environmental damage offsite and / or a compliance breach sanction
3	Chronic health effects causing partial impact on body function	RWDI (Minor loss of body part / function; LTI)	Property Damage / > $ US 50 – 100 k	1 – 3 day delay production	Small-scale environmental damage offsite and / or a reportable compliance breach
4	Health impact requiring medical treatment / intervention; not permanent	Medical treatment (Treatment that **must** be given by a doctor)	Property Damage / $ US 1 – 50 k	1 – 3 shift delay production	Significant environmental damage onsite only and / or a technical compliance breach
5	Transitory health impact	Minor impact (First aid treatment)	Property Damage < $ US 1000	1 shift delay production	Minor environmental impact and / or a technical compliance breach

Figure 2.5 Consequence Matrix used to Evaluate Risk Assessment Results

LIKELIHOOD OF SPECIFIED CONSEQUENCES				
A Many times per year	B Once or twice per year	C Once in 5 years	D Once in approx. 15 years	E Unlikely in life of mine
1 SIGNIFICANT	2 SIGNIFICANT	4 SIGNIFICANT	7 HIGH	11 HIGH
3 SIGNIFICANT	5 SIGNIFICANT	8 HIGH	12 HIGH	16 MEDIUM
6 HIGH	9 HIGH	13 MEDIUM	17 MEDIUM	20 LOW
10 HIGH	14 MEDIUM	18 LOW	21 LOW	23 LOW
15 MEDIUM	19 LOW	22 LOW	24 LOW	25 LOW

Figure 2.6 Risk Acceptance Matrix used to Evaluate Risk Assessment Results

The risk analysis was used to evaluate the overall risks of these accidents. This step relied on a risk acceptance matrix. The risk acceptance

Each accident type was then mapped onto the risk matrix to provide its overall risk level as per the following colours:

- **Green** (Low risk number 18 to 25): Risk is tolerable, though low cost risk reduction measures should still be considered for implementation. Take corrective actions as considered necessary.

- **Yellow** (Medium risk number 13 to 17): Risk is As Low as Reasonably Possible (ALARP) if all justified risk reduction measures have been implemented. Take corrective action within a reasonable timeframe and control measure to be reviewed where appropriate.
- **Orange** (High risk number 6 to 12): Take corrective / preventive action immediately and control measures to be reviewed or established by management.
- **Red** (Significant risk number 1 to 5): Stop the activity, take corrective / preventive action immediately and only recommence the activity when controls are in place.

E. Risk Control

This stage identifies the specific control measures to be adopted. DNV Risk Mitigation Strategies techniques are used at this stage to support the identification and choice of recommendations.

CHAPTER III
METHODOLOGY

To assist in the implementation of this thesis, it is necessary to make a sequence of method into the terms of reference in the implementation of the tasks of this thesis. This methodology as shown in Figure 3.1 contains steps taken to address the problems of the work of this thesis. Starting from identification of problems to eventually get a conclusion for the working of this thesis.

3.1 Methodology Flow Chart

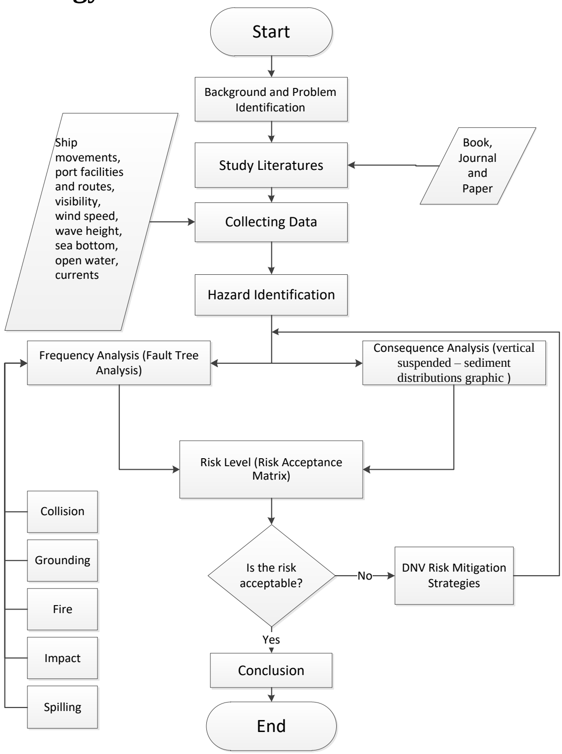

Figure 3.1 Methodology of the Study

3.2 Background

Before conducting the research, at first the background of this study will be explained.

3.3 Literature Study

The literature study is an early stage is the stage of learning about the basic theories to be discussed or used in the thesis. Source taken at this stage comes from books, papers, websites, journals, and so forth.

3.4 Data Collection

This phase is to obtain information that related to coal loading process in port.

3.5 Hazard Identification

This phase seeks to identify known hazards expected to be encountered because of the nature and/or area of the operation, and the existing risk control measures relating to those hazards. Equally importantly, it also seeks to identify any new hazards created as a result of the proposed service or operation.

3.6 Frequency Analysis

Frequency analysis is a descriptive statistical method that shows the number of occurrences of each response chosen by the respondents.

3.7 Consequence Analysis

The process of examining the possible effects of a planned activity. This study examining the possible effects of marine hazards caused in coal loading process in port using vertical suspended – sediment distributions graphic.

3.8 Risk Analysis

The risk analysis was used to evaluate the overall risks of accidents. This step relied on a risk acceptance matrix. The risk acceptance matrix is developed based on the framework provided from KPC Risk Rank.

3.9 Mitigations

This stage identifies the specific control measures to be adopted. DNV Risk Mitigation Strategies techniques are used at this stage to support the identification and choice of recommendations.

3.10 Conclusion

This stage is summarize about this bachelor thesis research, such as the result of this bachelor thesis and what could we learn about this thesis. Furthermore, this stage is also provide what else can be done in the future about this topic.

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CHAPTER IV
DATA ANALYSIS AND DISCUSSION

4.1 General Description

This bachelor thesis' research object is coal terminal that belongs to PT. Dire Pratama. This coal terminal facility is located in Lubuk Tutung, Bengalon Coal Project, Bengalon, Kutai Timur, Kalimantan Timur, Indonesia. Coal loading process will be carried by barge and bulk carrier ships that come from outside Kalimantan Timur region. This survey data analysis below is collected in Lubuk Tutung coal terminal at 3rd – 8th October 2016.

4.2 Data

Data which needed for this bachelor thesis are:

a. Layout of Lubuk Tutung Coal Terminal, Bengalon Coal Project, Bengalon, Kutai Timur, Indonesia

Layout of Lubuk Tutung Coal Terminal, Bengalon Coal Project, Bengalon, Kutai Timur, Kalimantan Timur, Indonesia is map location of coal terminal that belongs to PT. Dire Pratama which capable as coal loading and unloading terminal. Layout of Lubuk Tutung Coal Terminal could be seen in Figure 4.1. Meanwhile, for more detail drawing in general arrangement plan could be seen in the attachment.

Figure 4.1 Layout of Lubuk Tutung Coal Terminal (Source: PT. Dire Pratama, 2015)

b. Operational steps of coal loading process

Coal loading process in Lubuk Tutung coal terminal has several steps, which are:

- The ROM area (Run On Mine) is the first phase in handling the coal. Coal is trucked by the operator from the mine site, which is approximately 22 km away. Coal can be stockpiled on the ROM area, or dumped directly into the ROM hopper using 95m³ side-tipping trucks with tandem trailers.

- The dust suppression system for the hopper is controlled by an infrared sensor which detects a truck when in the hopper dump position.
- A Stamler Feeder Breaker FB-01 is located under the ROM Hopper and is designed to handle a maximum of 1-meter sized coal lumps. There is a grizzly grille fitted at the top of the Hopper to eliminate any lumps larger than 1 meter. These lumps must be broken up or removed manually.
- Coal from the FB 01 is discharged on to conveyor No.1 (CV-01) where it is carried 70 meters to the top of the Sizer Tower. CV-01 has a 1400 mm wide belt which travels at 4.25 m/s. CV-01 has a design capacity of 2000 tons/hour.
- Coal from the CV 01 is discharged on to conveyor No.1A (CV-01A) where it is carried 42 meters to the top of the Sizer Tower. CV-01A has a 2400 mm wide belt which travels at 1.8 m/s. CV-01A has a design capacity of 2000 tons/hour.
- CV-01A has a metal Detector which will remove most metals, however if metal is still in the coal stream a metal detector fitted with a paint spay will mark the location of the metal object on the top of the coal stream and automatically shut down the conveyor.
- The Stamler Sizer (CR-01) has a nominal capacity of 2,000 tons/hour of coal, but in this installation it will run at 1,000 tons/hour. CR-01 receives coal from CV-01A, and by using synchronized rollers, crushes the coal to approximately 50 mm lumps. The re-sized coal then discharges onto CV-02. CV-02 is a reversing conveyor, which can direct coal to either ST-01 or ST-02 for stockpiling.

- Conveyor CV-02 transports coal from the Stamler Sizer CR-01 to Stackers ST-01 or ST-02. CV-02 is 1200 mm wide and a travel at 5.25 m/s. CV-02 has a capacity of 2000 tons/hour of coal. CV-02 conveyor has a reversible belt that can feed to only one Stacker at a time.
- Stackers ST-01 & ST-02 transport coal from CV-02 to the Product Stockpiles Each stockpile has a coal storage capacity of 60,000 m^3 (total 120,000 m^3) which, with stockpile 'push-out', is expected to increase to some 80,000 m^3.
- The Reclaimers RC-01 & RC-02 have a rated capacity of some 3,000 tons/hour, but in this application they will nominally run up to 2,000 tons/hour of coal. Coal will be loaded from the Product Stockpiles by a bulldozer (or equivalent) into the respective intake plates of each Reclaimer. The coal is then picked up by a drag conveyor and moved through the machine to a discharge chute which will dump the coal onto either CV-03 for RC-01 or CV-04 for RC-02, depending on which Reclaimer is in operation at the time.
- Both Reclaimers & associated conveyor can be operated together with course blending of coals being possible on to CV-05.
- Conveyors CV-03 & CV-04 transport coal from the Stamler Reclaimers RC-01 and RC-02 to the Barge Loading Conveyor CV-05.
- Each of these Conveyors has a 1,400 mm wide belt running at 5.25 m/s with a nominal capacity of 2000 tons/hour of coal. Both Conveyors and Reclaimers can be operated simultaneously for rough blending of coal from the two Stockpiles if required. If either CV-03 or

04 is shutdown due to activation of the metal detectors, the corresponding Reclaimer will also shut down.

- If CV-05 is also tripped for any reason, the currently operating conveyor/s and reclaimer/s will also be shutdown.
- Conveyor CV-05 has a 1,400 mm wide belt traveling at a speed of 5.5 m/s with a nominal capacity of 2000 tons/hour of coal. CV-05 is equipped with a Belt Scale BS-2, which totalizes the amount of coal delivered to the Coal Barges.
- CV-05 also has the capability of variable speed. This is controlled locally & via the PLC from the control room.

c. Technical data of coal loading process

Several data of coal loading process in Lubuk Tutung coal terminal could be seen in Table 4.1.

Table 4.1 Technical Data of Coal Loading Process in Lubuk Tutung Coal Terminal (Source: PT. Dire Pratama, 2016)

Technical Data of the Facility	**Estimation Rate**
Conveyor speed	5.5 m/s
Flow rate of loading	2020 tons/hour
Berth/ unberth	1 – 2 hours
Loading time	4 – 6 hours
Number of barges	60 barges/month

d. Environmental data

Environmental data that had been obtained is environmental data around Lubuk Tutung coal terminal, on this following details:

- Air temperature : 27 – 35°C
- Wind speed : 0.6 – 2.3 m/s
- Humidity : 64 – 75%
- Water pH : 6.5 – 8.1

e. Ships and coal jetty terminal data

Ships and coal jetty terminal data contain information about basic data of ship, jetty and port. This data is as follows:

- Buoy coordinate : 00°44.31’ N - 117°46.04’ E
- Drop anchor area : 00°43’ 15°93’N - 117°48’ 18°27’ E
- Barge size 300 feet main dimensions
  L : 91 m
  B : 23 m
  T : 4.6 m
- Barge size 320 feet main dimensions
  L : 100 m
  B : 26 m
  T : 5.2 m
- Capesize Bulk Carrier
  L : 290 m
  B : 45 m
  T : 18 m

- Jetty

Length	: 175 m
Wide	: 5 m
Fender	: 7 set flat fender
Depth	: 7 m
Barge loader	: 2000 tons/hour

f. Characteristics data of coal material

Coal which will loaded to barge is coal that has specific characteristics. The coal data characteristics could be checked in the attachment.

4.3 Hazard Survey

This approach recognises that the people best placed to identify hazards are often personnel working within the port, but that a "new pair of eyes" also notices items of significance that are accepted as normal in the system. The benefits provided by those outside pair of eyes are very important to the success of the risk assessment.

The hazard survey process should be conducted on an Incident Category basis, across each area of the port. It should systematically consider vessel types, operations and interfaces appropriate to each area. The approach will be to undertake a general Hazard Identification on a geographical basis, followed by a number of smaller meetings concentrating on specific areas and assessment of specific operations. Hazards should be identified initially on a generic basis and then added to in order to consider scenarios specific to different areas of the port.

Identify the risks associated with port also could be based on information from the risk inventory.

A hazard survey discussion was held at the PT. Dire Pratama coal terminal in 3rd – 8th October 2016 attended by local port stakeholders, as outline in Table 4.2. It is noted that in addition to the hazard survey discussion has also been carried out with the company's environment regulations and Ministry of Environment regulations.

Table 4.2 Hazard Survey Discussion Attendees (Source: PT. Dire Pratama, 2016)

Person	Position
Aji Wardoyo	Vice Site Manager
Addo Yani	Senior Production Engineer
Muhammad Aufar	Maintenance Supervisor
Tenang Prasetyo	Safety Engineer

Table 4.3 Hazards Identified (Source: PT. Dire Pratama, 2016)

Category	**Hazard Title**	**Hazard Causes**
Collision	Collision of jetty with barge	Lack of maneuverability. High winds. Moorings out of position. Human error. Failure fatigue. Restricted visibility.
Collision	Collision of barge with bulk carriers	Lack of maneuverability. Lack of power. High winds. Buoy out of position. Failure to passage plan. Human error. Failure fatigue. Restricted visibility.

Table 4.3 Hazards Identified (Source: PT. Dire Pratama, 2016) (Continued)

Category	**Hazard Title**	**Hazard Causes**
Grounding	Grounding of barge	Lack of visibility from coning positions. Lack of maneuverability. Lack of power. Interaction with river topography (bank effect, squat, etc). High winds. Human error. Failure to passage plan.
Spillage	Coal spillage from conveyor to water surface in port area	High winds. Over-filled of coal. Mechanical defect/failure fatigue. Human error.
Foundered	Sinking of barge due to rough weather, leaks, breaking in two etc, but not due to other categories such as collision etc.	High winds. Over-filled of coal. Mechanical defect/failure fatigue. Human error.

Table 4.3 Hazards Identified (Source: PT. Dire Pratama, 2016) (Continued)

Category	Hazard Title	Hazard Causes
Foundered	Sinking of bulk carrier due to rough weather, leaks, breaking in two etc, but not due to other categories such as collision etc.	High winds. Over-filled of coal. Mechanical defect/failure fatigue. Human error.
Fire	Fire in bulk carriers. Where the fire/explosion is the first event reported, or where fire/explosion results from hull/machinery damage. In other words, it includes fires due to engine damage, but not fires due to collision etc.	Fire caused by faulty equipment. Human error. Inadequate precautions during hot work. Failure to take the appropriate precaution when handling coal (spontaneous combustion).
Fire	Spontaneous combustion of coal in loading process	Temperature of coal rises above its ignition point. The heat is unable to escape. Oxidation in the presence of moisture and air, or bacterial fermentation, which generates heat.

4.4 Frequency Analysis

Frequency analysis method that used for this study is FTA (fault tree analysis). FTA (fault tree analysis) used to look for initiating event of the scenario, based on failure rate of the events. Fault tree diagrams (or negative analytical trees) are logic block diagrams that display the state of a system (top event) in terms of the states of its components (basic events). Fault tree diagrams are a graphical design technique. An FTA is built top-down and in term of events rather than blocks. It uses a graphic "model" of the pathways within a system that can lead to a foreseeable, undesirable loss event (or a failure). The pathways connect contributory events and conditions, using standard logic symbols (AND, OR, etc.). The basic constructs in a fault tree diagram are gates and events.

The representation of FTA is in a form which can be understood, analyzed and, as necessary, rearranged to facilitate the identification of (Lindy Ellis 2001):

- Factors affecting the reliability and performance characteristics of the system, for example component fault modes, operator mistakes, environmental conditions, software faults;
- Conflicting requirements or specifications which may affect reliable performance;
- Common events affecting more than one functional component, which could cancel the benefits of specific redundancies.

Failure rate data for this study is according to Maritime Transportation Safety Management and Risk Analysis book by Svein Kristiansen and A Guide to Quantitative Risk Assessment for Offshore Installations by John Spouge.

FTA (fault tree analysis) that used for this study is refer to British Standard IEC 61025. FTA (fault tree analysis) is used to calculate failure of the system by display the state of a system (top event) in terms of the states of its components (basic events) based on the scenarios that had been done.

On this study, Relex 2009 is utilized to calculate frequency possibility of scenarios with FTA (fault tree analysis) method. Relex 2009 is a software that provide the basis for the reliability evaluation and analysis of systems by allowing to assess reliability metrics early in the design process. Relex 2009 has pathways that connect events and conditions, using standard logic symbols (AND, OR, etc.).

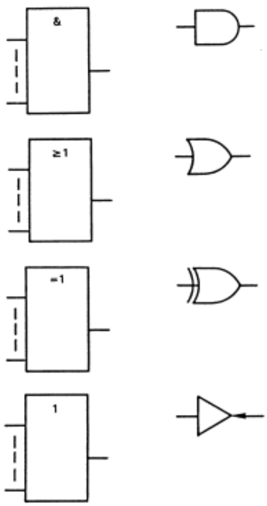
Fault tree analysis (FTA) method is related to definitions of standard logic such as “AND” or “OR”. This are the following explanations for those standard logic:

- AND gate : Output event occurs if all input events occur simultaneously.
  Formula for this gate is:

$$P\ (A\ and\ B) = P\ (A \cap B) = P(A)\ P(B) \tag{4.1}$$

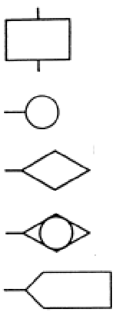
- OR gate : Output event occurs if any one of the input events occur.
  Formula for this gate is:

$$P\ (A\ or\ B) = P\ (A \cup B) = P(A) + P(B) - P\ (A \cap B) \tag{4.2}$$



Preferred symbol	Alternative symbol	Function	Description
		AND gate	Event occurs only if all input events occur simultaneously
		OR gate	Event occurs if any of the input events occur, either alone or in any combination
		Exclusive-OR gate	Event occurs only if one of the input events occurs alone (used typically with two input events)
		NOT gate	Event represents a condition which is an inverse of the condition defined by the input event

Figure 4.2 Description of Several Symbols that Used in FTA (1) (Source: British Standard Reliability of Systems, Equipment and Components, 2015)



Event description block	Name or description of the event, event code, and probability of occurrence (as required) shall be included within the symbol
Basic event	Event which cannot be subdivided
Undeveloped event	Event for which further subdivision was not done (usually because it was considered unnecessary)
Analyzed elsewhere	Event which is further developed on another fault tree
House	Event which has happened, or will happen with certainty

Figure 4.3 Description of Several Symbols that Used in FTA (2) (Source: British Standard Reliability of Systems, Equipment and Components, 2015)

Before calculating frequency, should have done qualitative descriptive screening to determine what kind of accidents that will be calculated. Qualitative descriptive screening is utilized because on histories accident that happened in Lubuk Tutung, there aren't many accidents. Furthermore, the traffic density and territorial waters around Lubuk Tutung is considered not crowded and rough.

Qualitative descriptive screening additionally considers personnel judgement in the area of Lubuk Tutung. This approach recognises that the people best placed to judge the accidents are often personnel working within the port.

Table 4.4 Descriptive Screening of Possible Accidents in Lubuk Tutung

Category	**Brief Explanation**	**Chance of Event**
Collision	There are barges and bulk carriers that operates daily in the territorial waters. In addition, there's also a coal loading jetty in the terminal.	Likely to occur
Grounding	There are barges and bulk carriers that operates daily in the territorial waters. Barges and bulk carriers operates near from the onshore of the coal loading jetty.	Likely to occur
Coal Spillage from Conveyor	Coal have through several steps before getting load to barges. If there's any error, the conveyor would stop automatically and immediately.	Unlikely to occur

Table 4.4 Descriptive Screening of Possible Accidents in Lubuk Tutung (Continued)

Category	**Brief Explanation**	**Chance of Event**
Foundered	Bulk carrier stopped, when the maneuverability of the bulk carrier is not really high it is less dangerous for barge to approach a vessel stopped in the water so that there will be a protected side from the waves and wind and there will also not be any bow wave. At that moment the barge approaches on the quarter of the bulk carrier and gets on a parallel heading at slow speed.	Unlikely to occur
Fire	Before coal getting loaded to barge, it will sprayed by water to prevent spontaneous combustion.	Unlikely to occur.

The benefits provided by those outside pair of eyes are very important to the success of the risk assessment. It is perhaps obvious that risk assessments undertaken totally in-house do not generally address all the issues, some of which will be related to problems that the organisation with responsibility has hesitation in addressing (Anatec Ltd., 2012).

As stated in the Table 4.4, there are two possible accidents that likely to occur. The possible accidents are collision and grounding. So, the accidents that will be calculated are collision and grounding.

Meanwhile, the other accidents did not considered as accident that are likely to occur, because it has several preventive procedures.

4.4.1 Collision Frequency

Collision can be defined as structural impact between two ships or one ship and a floating or still object. Ship collision is one of the most frequent accident that likely to happen. As fairway are getting more congested and ship speeds higher, there is a good possibility that a ship may experience an important accident during her lifetime.

Higher speeds may cause larger operational loads, like slamming, or excessively severe loads, for example during a collision. Denser sea routes increase the probability of an accident, involving ships or ships and shore or offshore structures (Antao, 2006). On this study, collision is calculated as powered vessel collision that used Quantitative Risk Assessment (QRA) method. Powered vessel collision is occur when vessel directly hit the object with propulsion system still operates.

Vessels that will be analysed on this study is all vessels that incoming and outgoing out in Lubuk Tutung port water area at 2016. This data is based on data survey that had been done in October 2016. The data could be seen at Table 4.5.

Table 4.5 Total Vessel in Lubuk Tutung Port Water Area in 2016

Total Vessels in One Year	**Total Vessels in One Day**	**Total Vessel in One Hour**
1440	4	0.167

There are several factors that caused collision:

- Human error
- Navigation failure
- High traffic density
- Visibility
- Tide
- Waves

Before frequency is calculated, should have considered the possibility of collision based on scenario that had been created. On this study, fault tree analysis (FTA) is used to calculated the possibility of collision that will happen in Lubuk Tutung port water area. Possibility value of collision's initiating factors that considered in this study is based on Maritime Transportation Safety Management and Risk Analysis book by Svein Kristiansen and A Guide to Quantitative Risk Assessment for Offshore Installations by John Spouge.

For passing vessels, collision risk is highly location dependent due to variation in ship traffic from one location to another. The ship traffic volume and pattern at the specific location should be considered with considerable.

Based on hazard survey that has been conducted, there are two types of collision accident that likely to occur in Lubuk Tutung territorial waters. The accidents that likely to occur are:

- Drifting collision between barge and bulk carrier
- Drifting collision between barge and coal jetty

According to A Guide to Quantitative Risk Assessment for Offshore Installations book by John Spouge in 1999, it is mentioned that drifting collision included as visiting vessel collision. Where definition of drifting collision is when the vessel loses power or suffers a failure of dynamic positioning, and drifts into the platform due to wind and waves, the impact velocity then depends on the wind speed and sea state.

Sequences of event (Spouge, 1999) for drifting collision are:

- The vessel must suffer a breakdown in its propulsion system
- The wind direction must heading to the platform or mother vessel and make the vessel drift towards the platform or mother vessel
- Any attempts to tow the vessel away must be unsuccessful
- The vessel must fail to repair itself before it reaches the platform

Figure 4.4 Collision between Ship and Ship (Source: Insight, 2016)

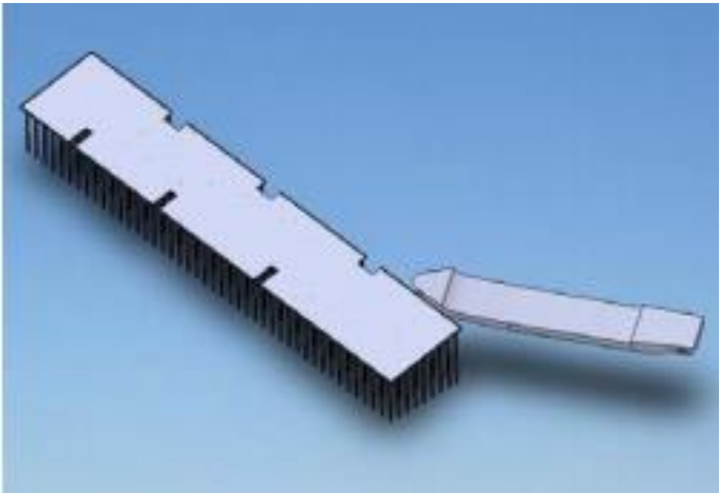


Figure 4.5 Collision between Ship and Jetty (Source: Nguyen, 2008)

Figure 4.4 and 4.5 shows the illustration of drifting collision that could happen in Lubuk Tutung territorial waters.

Meanwhile, fault tree analysis (FTA) for the drifting collision scenario could be seen in Figure 4.6. Collision would happen if all the collision's initiating factor occur. After fault tree analysis (FTA) had been created, the next step is to calculate frequency of collisions.

Possibility calculation from drifting collision scenario as shown in Figure 4.6.

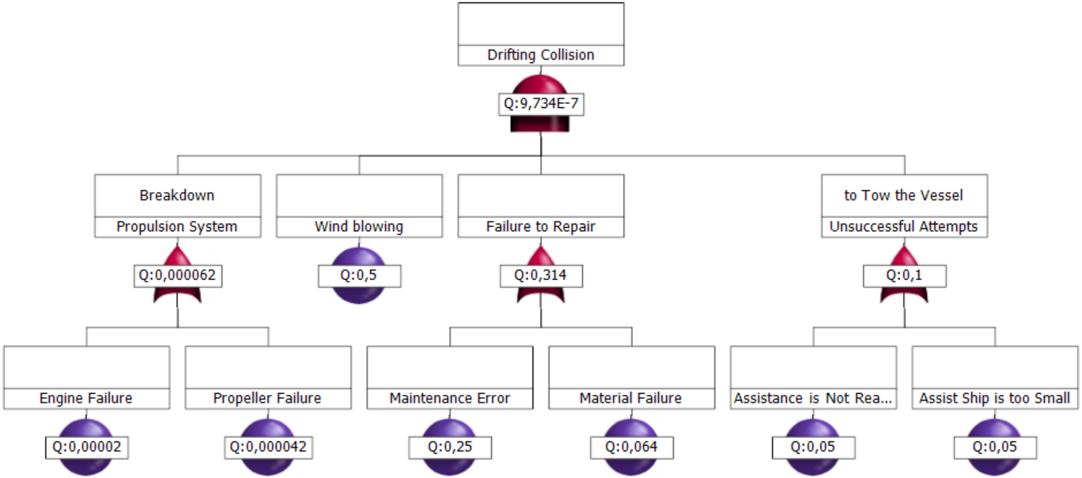


Figure 4.6 Drifting Collision Probability with Fault Tree Analysis (FTA) method

Frequency Collision of Barge with Bulk Carrier:

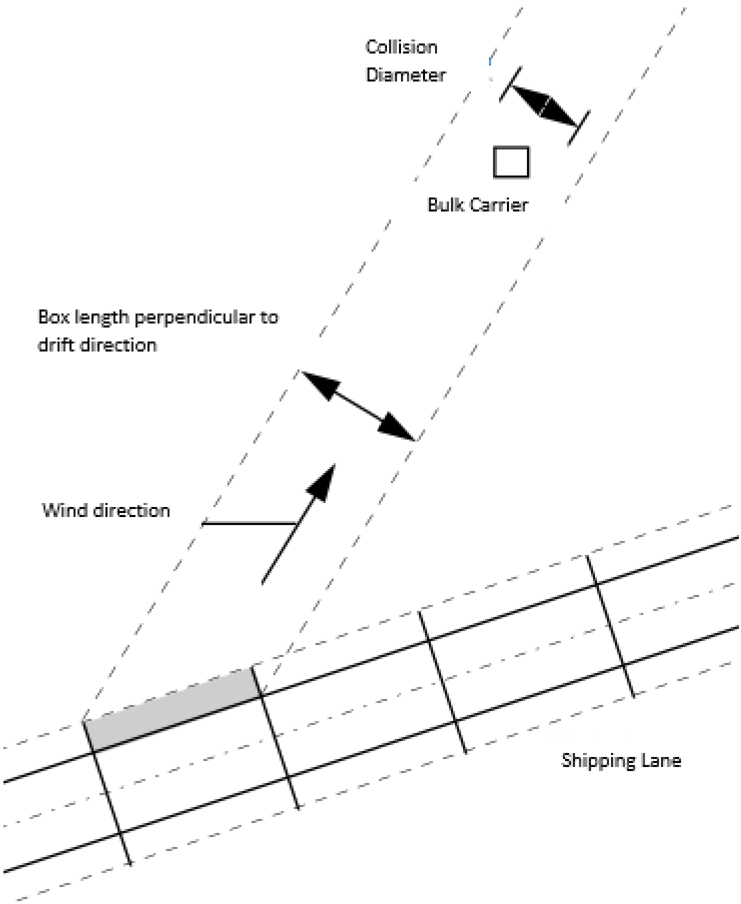


Figure 4.7 Collision Scenario of Barge with Bulk Carrier (Spouge, 1999)

A drifting collision is the result of an event that cannot be avoid by the crew on board, which causes a ship to lose power and starts to drifting. The event usually initiated by the failure of engine. After the failure of engine happened, the disabled ship starts to drifting in a direction with a certain drift velocity, depends on the environmental conditions, such as wind speed. Ship would drift on certain angle, the biggest angle of drift is considered as 60° (Paroka et al., 2014).

Collision would happen if the failure of engine occur and engine repair did not work out, in addition it also happened if there is any wind blow to the barge that heading to the coal jetty. Data of possible breakdown is obtained from A Guide of Quantitative Risk Assessment for Offshore Installations book by John Spouge in 1999. However, the possible breakdown could be change, based on the distance of ship with the object. Meanwhile the chance of wind blow is 0.5 (Pratiwi, 2015), and assumed that wind is blowing to both directions, right and left. Therefore, it is necessary to calculate the incoming and outgoing of barge.

Based on Figure 4.7, drifting collision frequency could be calculated with this following formula:

$$F_{DR} = N.\ P_B.\ P_W.P_T.P_R.D/BL \tag{4.3}$$

Where:

F_{DR} : frequency of vessel collisions (accidents/ year)
N : total traffic in the box (vessel movements/ year)
P_B : breakdown probability
P_W : the probability of wind blowing from box to platform
P_T : the probability of unsuccessful attempts to tow away
P_R : the probability of failed to repair
D : collision diameter (meter)
BL : box length perpendicular to wind direction (meter)

Collision diameter (D) is addition of bulk carrier width and vessel beam.

$$D = W_A + B \quad (4.4)$$

Width of bulk carrier (W_A) is 45 meters and vessel beam is 26 meters, so collision diameter is 71 meters. Then, details of calculation could be seen on this following table:

Table 4.6 Calculation of Cumulative Collision Frequency for Barge and Bulk Carrier

Notation	Item	Value
N	Total Traffic (N)	1080
P_B	Probability of Breakdown	0.000062
P_W	Probability of Wind Blowing	0.5
P_T	Probability of Unsuccessful Attemps to Tow Away	0.1
P_R	Probability of Failed to Repair	0.314
D	Collision Diameter	71
BL	Box Length Perpendicular to Wind Direction	100
Drifting Collision Frequency		0.00074
Cumulative Drifting Collision Frequency		0.00149

From Table 4.6, could be seen that cumulative collision frequency of barge with bulk carrier (F_{DR}) for incoming and outgoing is 0.0015.

Frequency Collision of Barge with Coal Loading Jetty:

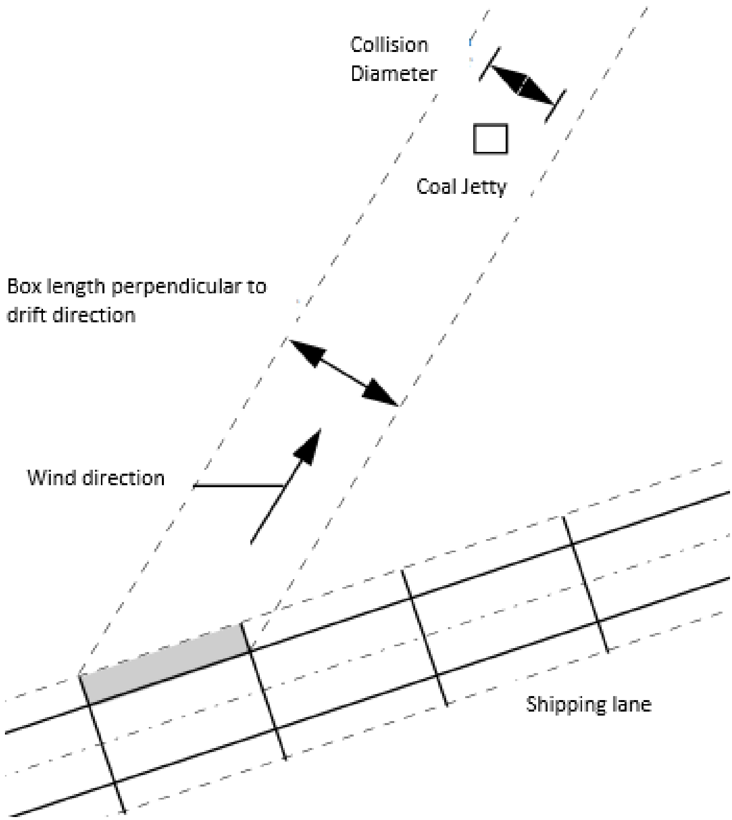


Figure 4.8 Collision Scenario of Barge with Coal Jetty (Source: Spouge, 1999)

Besides drifting collision between barge and bulk carrier, there is drifting collision that would happened between barge and coal jetty. A drifting collision is the result of an event that cannot be avoid by the crew on board, which causes a ship to lose power and starts to drifting. The event usually initiated by the failure of engine. After the failure of engine happened, the disabled ship starts to drifting in a direction with a certain drift velocity, depends on the environmental conditions, such as wind speed. Ship would drift on certain angle, the biggest angle of drift is considered as 60° (Paroka et al., 2014).

Collision would happen if the failure of engine occur and engine repair did not work out, in addition it also happened if there is any wind blow to the barge that heading to the coal jetty. Data of possible breakdown is obtained from A Guide of Quantitative Risk Assessment for Offshore Installations book by John Spouge in 1999. However, the possible breakdown could be change, based on the distance of ship with the object. Meanwhile the chance of wind blow is 0.5 (Pratiwi, 2015), and assumed that wind is blowing to both directions, right and left. Therefore, it is necessary to calculate the incoming and outgoing of barge.

Then, drifting collision frequency could be calculated with this following formula:

$$F_{DR} = N.\ P_B.\ P_W.P_T.P_R.D/BL \tag{4.5}$$

Where:

F_{DR}	: frequency of vessel collisions (accidents/ year)
N	: total traffic in the box (vessel movements/ year)
P_B	: breakdown probability
P_W	: the probability of wind blowing from box to platform
P_T	: the pobability of unsuccessful attemps to tow away
P_R	: the probability of failed to repair
D	: collision diameter (meter)
BL	: box length perpendicular to wind direction (meter)

Collision diameter (D) is addition of bulk carrier width and vessel beam.

$$D = W_A + B \tag{4.6}$$

Width of coal jetty (W_A) is 175 meters and vessel beam is 26 meters, so collision diameter is 201 meters. Then, details of calculation could be seen on this following table:

Table 4.7 Calculation of Cumulative Collision Frequency for Barge and Coal Jetty

Notation	Item	Value
N	Total Traffic (N)	1080
P_B	Probability of Breakdown	0.000062
Pw	Probability of Wind Blowing	0.5
Pt	Probability of Unsuccessful Attemps to Tow Away	0.1
Pr	Probability of Failed to Repair	0.314
D	Collision Diameter	201
BL	Box Length Perpendicular to Wind Direction	100
Drifting Collision Frequency		0.002113057
Cumulative Drifting Collision Frequency		0.004226113

From Table 4.7, could be seen that cumulative drifting collision frequency of barge with coal jetty (F_{DR}) for incoming and outgoing is 0.0042.

4.4.2 Grounding Frequency

Ship grounding is a type of ship accident that include the impact of a ship on seabed or waterway side. It may result in the damage of the submerged part of the ship's hull and in particularly the bottom structure; potentially leading to water entrance, that could be has effect to the ship's stability and safety (Mazaheri, 2013).

Critical grounding applies extreme loads onto ship structures. In less impact accidents, it might result in just merely some damages to the hull; however in most serious accidents it might lead to hull breach, cargo spills, total loss of the vessel, and in the worst case, human casualties. On this study, grounding is calculated as grounding model that based on Maritime Transportation Safety Management and Risk Analysis book by Svein Kristiansen. The grounding scenario is based on a straight fairway section.

Vessels that will be analysed on this study is all vessels that incoming and outgoing out in Lubuk Tutung port water area at 2016. This data is based on data survey that had been done in October 2016. The data could be seen at Table 4.8.

Table 4.8 Total Vessel in Lubuk Tutung Port Water Area in 2016

Total Vessels in One Year	**Total Vessels in One Day**	**Total Vessel in One Hour**
1440	4	0.167

There are several factors that caused grounding:

- Current
- Darkness
- Tide

- Waves
- Wind

Before frequency is calculated, should have considered the possibility of grounding based on scenario that had been created. On this study, fault tree analysis (FTA) is used to calculated the possibility of grounding that will happen in Lubuk Tutung port water area. Possibility value of grounding's initiating factors that considered in this study is based on Maritime Transportation Safety Management and Risk Analysis book by Svein Kristiansen and A Guide to Quantitative Risk Assessment for Offshore Installations by John Spouge.

Based on hazard survey that has been conducted, there are two types of grounding accident that likely to occur in Lubuk Tutung territorial waters. The accidents that likely to occur are:

- Grounding of Barge
- Grounding of Bulk Carrier

On Lubuk Tutung coal terminal, barge does not intended to be grounded. Because barge would berthing with utilizing the fender that already installed in the coal jetty.

According to Maritime Transportation Safety Management and Risk Analysis by Svein Kristiansen in 2005, a ship moving in a restricted seaway without any other traffic is subject to grounding hazards. The coastal zones, shoals, rocks and islands are basically stationary objects relative to the vessel. The estimation of the probability that an incident will lead to an accident will be based on certain assumptions of how the vessel moves in the critical phase.

Sequences of event (Kristiansen, 2005) for grounding are:

- Control of a ship is lost owing to failure in the navigation system due to either technical or human factors or both
- There is an obstacle in the middle of the fairway representing a grounding hazard

Figure 4.9 Grounding of Bulk Carrier (Insight, 2011)

Figure 4.10 Grounding of Coal Barge (Alamy, 2009)

Figure 4.9 and 4.10 shows the illustration of drifting collision that could happen in Lubuk Tutung territorial waters.

Meanwhile, fault tree analysis (FTA) for the grounding scenario could be seen in Figure 4.11. Grounding would happen if all the grounding's initiating factor occur. After fault tree analysis (FTA) had been created, the next step is to calculate frequency of groundings.

Possibility calculation from grounding scenario as shown in Figure 4.11.

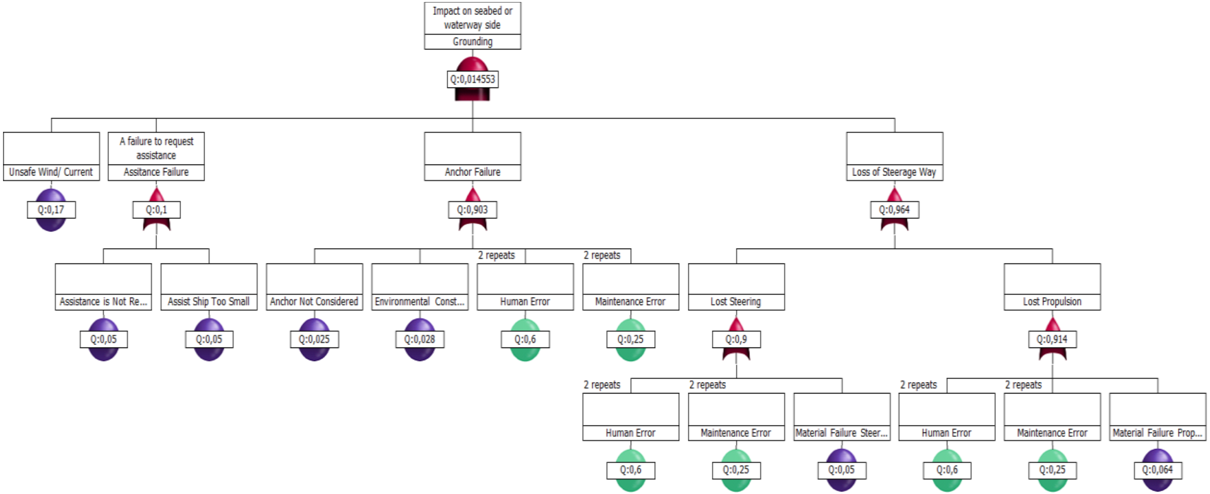


Figure 4.11 Grounding Probability with Fault Tree Analysis (FTA) method

Grounding Frequency for Barge:

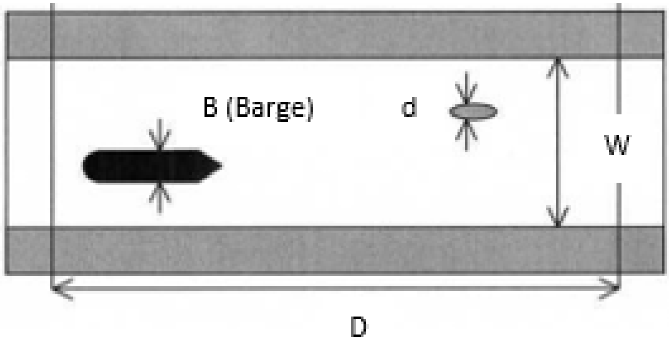


Figure 4.12 Modelling Grounding of Coal Barge (Kristiansen, 2005)

There is a coal jetty located in Lubuk Tutung. Coal is going to be transported from the coal jetty by barge through a shipping lane of width 15000 meters (Kaltim, 2011). Meanwhile, there is another coal jetty form other company, that representing a grounding hazard. The width of the coal jetty is equal to 5 meters. The capacity of the coal jetty requires 3 barges for daily operation. The mean beam of these ships is 26 meters. The risk of grounding has to be quantified in order to assess the safety of the coal operation.

The probability that the uncontrolled barge hits the obstacle is then exclusively dependent on the dimensions of the fairway and the beam of the barge. Could be calculated with this following formula:

$$P_I = \frac{B+d}{W} \tag{4.7}$$

Where:

P_I : probability that the uncontrolled barge hits the obstacle
B : breadth of barge (meter)
d : width of coal jetty (meter)
W : width of shipping lane (meter)

Table 4.9 Probability Barge Hits the Obstacle

Breadth of Barge (B)	Width of Coal Jetty (d)	Width of Shipping Lane (W)	Probability Hits (PI)
26	5	15000	0.00207

Then, grounding frequency could be calculated with this following formula:

$$F_{GR} = N.\ P_I.\ P_1.\ P_2.\ P_3.\ P_4 \qquad (4.8)$$

Where:

F_{GR} : frequency of vessel groundings (accidents/ year)
N : total traffic in the lane (vessel movements/ year)
P_I : the probability of vessel hits the obstacle
P_1 : the probability of unsafe wind/ current
P_2 : the probability of failure to request assistance
P_3 : the probability of anchor failure
P_4 : the probability of lost steering

Table 4.10 Grounding Frequency of Barge

	Barge
Total Traffic (N)	1080
Hits Obstacle (PI)	0.00207
Unsafe Wind/ Current (P1)	14.3%
Failure to Request (P2)	46%
Anchor Failure (P3)	12%
Lost Steering	96%
Grounding Frequency	0.017

From Table 4.10, could be seen that grounding frequency of barge (F_{GR}) is 0.017.

Grounding Frequency for Bulk Carrier:

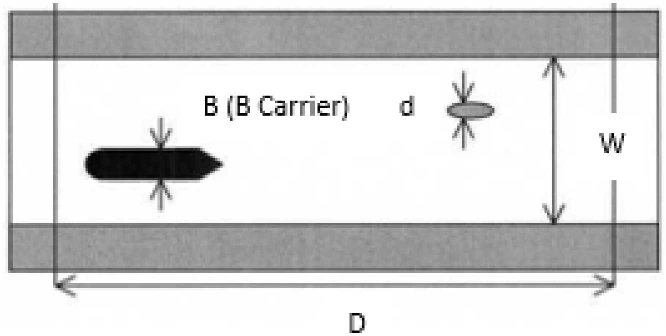


Figure 4.13 Modelling Grounding of Bulk Carrier

There is a coal jetty located in Lubuk Tutung. Coal is going to be transported from the coal jetty by bulk carrier through a shipping lane of width 15000 meters (Kaltim, 2011). Meanwhile, there is another coal jetty form other company, that representing a grounding hazard. The width of the coal jetty is equal to 5 meters. The capacity of the coal jetty requires 1 bulk carrier for daily operation. The mean beam of these ships is 45 meters. The risk of grounding has to be quantified in order to assess the safety of the coal operation.

The probability that the uncontrolled bulk carrier hits the obstacle is then exclusively dependent on the dimensions of the fairway and the beam of the bulk carrier. Could be calculated with this following formula:

$$P_I = \frac{B+d}{W} \qquad (4.9)$$

Where:

P_I : probability that the uncontrolled bulk carrier hits the obstacle
B : breadth of bulk carrier (meter)
d : width of coal jetty (meter)
W : width of shipping lane (meter)

Table 4.11 Probability Bulk Carrier Hits the Obstacle

Breadth of Bulk Carrier (B)	Width of Coal Jetty (d)	Width of Shipping Lane (W)	Probability Hits (PI)
45	5	15000	0.0033

Then, grounding frequency could be calculated with this following formula:

$$F_{GR} = N.\ P_I.\ P_1.\ P_2.\ P_3.\ P_4 \tag{4.10}$$

Where:

F_{GR} : frequency of vessel groundings (accidents/ year)
N : total traffic in the lane (vessel movements/ year)
P_I : the probability of vessel hits the obstacle
P_1 : the probability of unsafe wind/ current
P_2 : the probability of failure to request assistance
P_3 : the probability of anchor failure
P_4 : the probability of lost steering

Table 4.12 Grounding Frequency of Bulk Carrier

	Bulk Carrier
Total Traffic (N)	360
Hits Obstacle (PI)	0.0033
Unsafe Wind/ Current (P1)	14.3%
Failure to Request (P2)	46%
Anchor Failure (P3)	12%
Lost Steering	96%
Grounding Frequency	0.009

From Table 4.12, could be seen that grounding frequency of bulk carrier (F_{GR}) is 0.009.

4.4.3 Total Coal Loss Frequency

The following results are provided:

- The total accident frequency (accidents per year).
- The "spilling" accident frequency (accidents per year). This result characterizes those accidents that are sufficiently severe that results on coal cargo spilled from the cargo holds
- The total loss frequency (accidents per year). This is an estimate of those accidents that are sufficiently severe that may lead to the total loss of the barge/ bulk carrier.

The "spilling" accident frequency were calculated using probabilities derived from an analysis of spills from tanker accidents worldwide. DNV considers that this approximation is justified given the level of risk estimated. These accident frequency results are shown in Table 4.113.

Table 4.13 Results for Coal Loss Frequency

Accident Type	Total Frequency	Spilling Frequency	Total Loss Frequency
Grounding of Barge	0.017	$5.6.10^{-4}$	$9.52.10^{-6}$
Grounding of Bulk Carrier	0.009	$5.6.10^{-4}$	$5.04.10^{-6}$
Collision of Barge with Bulk Carrier	0.0015	$1.5.10^{-3}$	$2.25.10^{-6}$
Collision of Barge with Coal Loading Jetty	0.0042	$1.5.10^{-3}$	$6.3.10^{-6}$

After total loss frequency is obtained, the next step is to compare with frequency matrix to find out which accident belongs to which frequency category. Frequency matrix that used on this study is from DNV standard. The frequency matrix could be seen in Figure 4.14.

Category	Frequency (per year)	Interval (years)
Very High	>0.1	<10
High	0.01 to 0.1	10 to 100
Moderate	0.001 to 0.01	100 to 1000
Low	0.0001 to 0.001	1000 to 10.000
Very Low	<0.0001	>10.000

Figure 4.14 DNV Frequency Matrix

Based on the Figure 4.14, all of the accidents that had been calculated belong to very low category. The accidents are "grounding of barge", "collision of barge with bulk carrier", "grounding of bulk carrier" and "collision of barge with coal loading jetty".

Meanwhile, the highest frequency level of accident is "grounding of barge", the second highest frequency level of accident is "collision of barge with coal loading jetty", the third highest frequency level of accident is "grounding of bulk carrier" and the lowest is "collision of barge with bulk carrier".

Therefore, based on the calculation, frequency level of accident that would have coal spill as an immediate impact is considered as very low category.

4.5 Consequence Analysis

Sediments play an important role in elemental cycling in the aquatic environment. It is responsible for transporting a significant proportion of many nutrients and contaminants. It also mediate their uptake, storage, release and transfer between environmental compartments. Most sediment in surface waters derives from surface erosion and comprises a mineral component, arising from the erosion of bedrock, and an organic component arising during soil-forming processes (United Nations Environment Programme, 1996). An additional organic component may be added by biological activity within the water body.

For the purposes of aquatic monitoring, sediment can be classified as deposited or suspended. Deposited sediment is that found on the bed of a river or lake. Suspended sediment is that found in the water column where it is being transported by water movements. Suspended sediment is also referred to as suspended matter, particulate matter or suspended solids (United Nations Environment Programme, 1996). Generally, the term suspended solids refers to mineral and organic solids, whereas suspended sediment should be restricted to the mineral fraction of the suspended solids load.

Parameter that will be used for this graphic is Ministerial Decree of Indonesia’s Ministry of Environment number 1 in 2010. This Ministerial Decree regulates water quality in coal business.

Calculated concentration of vertical suspended-sediment distributions can be obtained by Rouse Equation (Rouse, 1937):

$$C(z) = Cref \exp \left(\frac{\omega s}{\beta} \int_{za}^{z} \frac{dz}{Ks}\right) \qquad (4.11)$$

Or could be calculated from this following equation (Dyer, 1986):

$$C(z) = Cref.\left(\frac{-z(d+zref)}{(d+z)(-zref)}\right)^{\frac{\omega s}{\beta k u}} \quad (4.12)$$

Where:

C(z)	: concentration at the height
Cref	: reference concentration
ωs	: particle settling velocity
β	: coefficient between diffusivity for sediment and momentum, usually assumed to be unity (Dyer, 1986)
Ks	: sediment type
k	: Von Karman constant (0.4)
z	: elevation
zref	: reference elevation
d	: water depth
u	: shear velocity

Consequence scenario:

- Lubuk Tutung port located in Kalimantan Timur area, which has typical sand/ mud bank of its sea bed (Buschman et al., 2012)
- Reference concentration that used on this study is 260 mg/L at reference elevation 8 meters, this value based on study about suspended sediment load in Kalimantan Timur area that had been done (Buschman et al., 2012).
- Lubuk Tutung port waters which bulk carrier and barge operates have water depth from 0 until 25 meters.
- Particle settling velocity in Kalimantan Timur sea is 1.0 m/s (Buschman et al., 2012) and shear velocity in Kalimantan Timur sea is 0.52 m/s (Sassi, 2011)

Concentration calculation could be seen on this following table:

Table 4.14 Sediment Concentration Profile Calculated Using Equation 4.12

Elevation (m)	Concentration (mg/L)
0	0
2	13
4	63
6	148
8	260
10	392
12	538
14	693
16	854
18	1018
20	1183
22	1347
24	1509

Regulation for wastewater concentration about contamination of coal (TSS/ Total Suspended Solids) in Indonesia refer to Ministerial Decree of Indonesia's Ministry of Environment number 1 in 2010.

Table 4.15 Regulation for Wastewater Concentration

Type of Pollution	**Concentration (mg/L)**		
	Low	**Medium**	**High**
Total Suspended Solids	100	220	350

Examples of total suspended solids concentration on water could be seen in Figure 4.15.

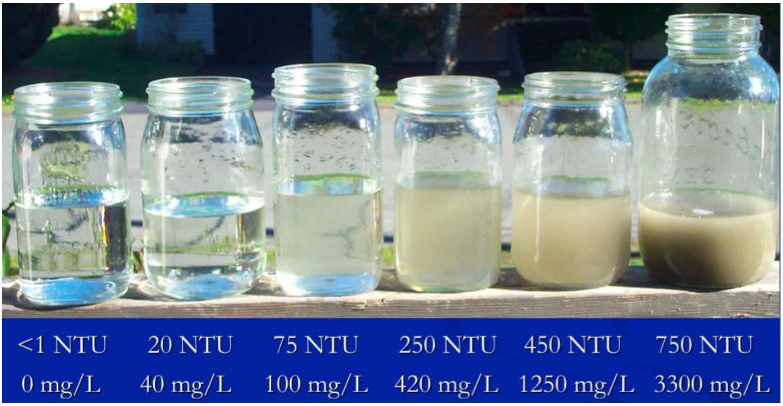


Figure 4.15 Total Suspended Solids Concentration

Based on the result and regulation that have been obtained, graphic of consequence scenario can be drawn. Graphic of consequence scenario could be seen in Figure 4.16.

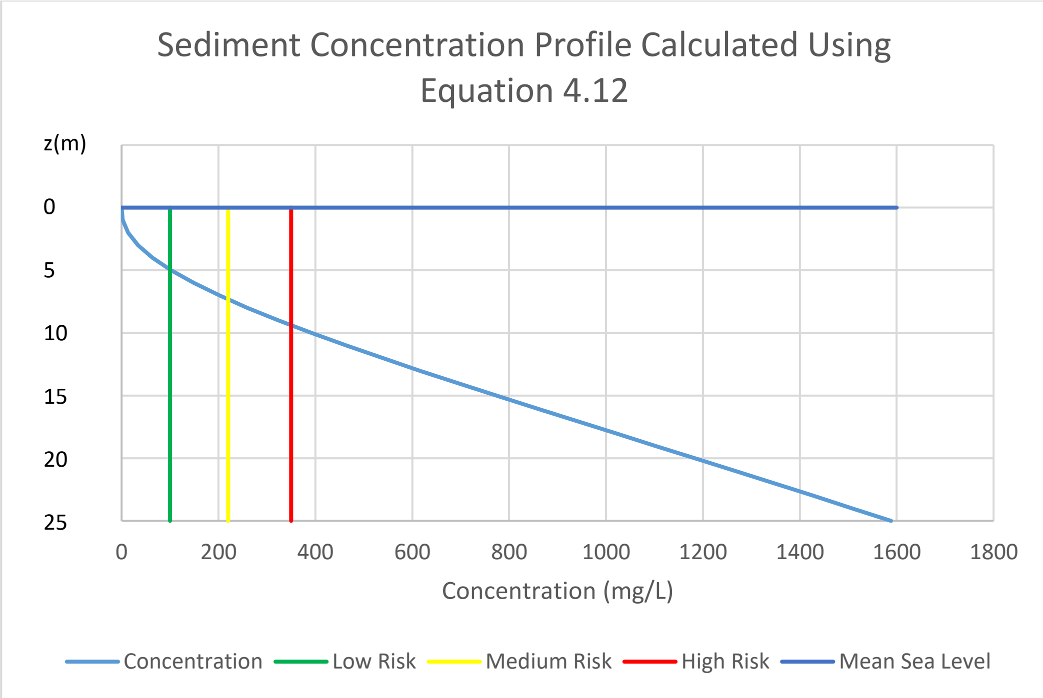


Figure 4.16 Graphic of Sediment Concentration Profile Calculated Using Equation 4.12

According to figure 4.16, concentration on 25 until 20 meters elevation considered as safe risk, since it is below low risk line. In addition, 20 until 17.5 meters elevation considered as low risk, 17.5 until 15 meters elevation considered as medium risk and below 15 meters elevation considered as high risk.

4.6 Risk Analysis

Risk analysis basically involves the calculation of the magnitude of potential consequences (levels of impacts) and the frequency. After frequency and consequences has been obtained, then these value would be plotted to risk acceptance matrix. The risk acceptance matrix used for this study is based on risk matrix that provided from the company. It should be noted that the scope of this study is only to the environment. The risk acceptance matrix could be seen in Figure 4.17.

	HEALTH CONSEQUENCES	SAFETY CONSEQUENCES	PROPERTY DAMAGE CONSEQUENCE	PRODUCTION CONSEQUENCE	ENVIRONMENTAL CONSEQUENCES
1	Long term chronic health effects to workers or public with potential for death	Fatality (Fatality, multiple fatality; major permanent disability)	Property Damage / >$ US 500k	More than 1week delay production	Large-scale, long-term environmental damage offsite and / or a compliance breach that threatens continued operation
2	Long term chronic health effects to workers or public with major impact on body function / lifestyle	LDI (Serious injury and hospitalization; permanent disability)	Property Damage / > $ US 100 – 500 K	3 – 6 day delay production	Large-scale, short-term environmental damage offsite and / or a compliance breach sanction
3	Chronic health effects causing partial impact on body function	RWDI (Minor loss of body part / function; LTI)	Property Damage / > $ US 50 – 100 k	1 – 3 day delay production	Small-scale environmental damage offsite and / or a reportable compliance breach
4	Health impact requiring medical treatment / intervention; not permanent	Medical treatment (Treatment that **must** be given by a doctor)	Property Damage / $ US 1 – 50 k	1 – 3 shift delay production	Significant environmental damage onsite only and / or a technical compliance breach
5	Transitory health impact	Minor impact (First aid treatment)	Property Damage < $ US 1000	1 shift delay production	Minor environmental impact and / or a technical compliance breach

Figure 4.17 Risk Acceptance Matrix (1)

LIKELIHOOD OF SPECIFIED CONSEQUENCES				
A Many times per year	B Once or twice per year	C Once in 5 years	D Once in approx. 15 years	E Unlikely in life of mine
1 SIGNIFICANT	2 SIGNIFICANT	4 SIGNIFICANT	7 HIGH	11 HIGH
3 SIGNIFICANT	5 SIGNIFICANT	8 HIGH	12 HIGH	16 MEDIUM
6 HIGH	9 HIGH	13 MEDIUM	17 MEDIUM	20 LOW
10 HIGH	14 MEDIUM	18 LOW	21 LOW	23 LOW
15 MEDIUM	19 LOW	22 LOW	24 LOW	25 LOW

Figure 4.28 Risk Acceptance Matrix (2)

The colour of each frequency - consequence pair on the matrix indicates the level of risk:

- **Green** (Low risk number 18 to 25): Risk is tolerable, though low cost risk reduction measures should still be considered for implementation. Take corrective actions as considered necessary.

- **Yellow** (Medium risk number 13 to 17): Risk is As Low as Reasonably Possible (ALARP) if all justified risk reduction measures have been implemented. Take corrective action within a reasonable timeframe and control measure to be reviewed where appropriate.
- **Orange** (High risk number 6 to 12): Take corrective / preventive action immediately and control measures to be reviewed or established by management.
- **Red** (Significant risk number 1 to 5): Stop the activity, take corrective / preventive action immediately and only recommence the activity when controls are in place.

Before plotted the frequency and consequences to the risk matrix, should have known the consequence level of each accidents. The consequence level of each accidents are listed on this following details:

- Consequence level for collision of barge with coal jetty is considered as low risk. Because the water depth of this accident approximately would be 0 to 7 meters.
- Consequence level for collision of barge with bulk carrier is considered as high risk. Because the water depth of this accident approximately would be above 10 meters.
- Consequence level for grounding of barge is considered as low risk. Because the water depth of this accident approximately would be 0 to 7 meters.
- Consequence level for grounding of bulk carrier is considered as low risk. Because the water depth of this accident approximately would be 0 to 7 meters.

The risk results based on each accident are shown in Table 4.15.

Table 4.15 Risk Results

Accident Type	Total Loss Frequency	Consequence Level	Risk Category
Collision of Barge with Coal Loading Jetty	Very Low	Low Risk	25 Low
Collision of Barge with Bulk Carrier	Very Low	High Risk	11 High
Grounding of Barge	Very Low	Low Risk	25 Low
Grounding of Bulk Carrier	Very Low	Low Risk	25 Low

Table 4.15 shows there are three of the risk assessed are green (risk is tolerable, though low cost risk reduction measures should still be considered for implementation and take corrective actions as considered necessary). One of the risk assessed is orange (take corrective / preventive action immediately and control measures to be reviewed or established by management). From this risk assessment, it could conclude that the coal loading operations in Lubuk Tutung coal terminal are needed to prevent risk by implement mitigation strategies.

The mitigation strategies listed below is based on DNV (Det Norske Veritas) Risk Assessment Coal Operation Report.

Table 4.16 Risk Mitigation Strategies

Category	**Risk Management Strategies**
Equipment Selection and Inspection	• All tugs will be inspected at regular intervals to ensure they meet the required regulations. • Barges will be inspected at regular intervals. • Tugs will be selected in accordance with the then-current weather conditions and barge load characteristics, in order to ensure a proper match between tugs and barges.

Table 4.16 Risk Mitigation Strategies (Continued)

Category	Risk Management Strategies
Operation Structure	• Barge operations will not be conducted in high wind conditions, in order to lessen the chances of an accident. • All night time operations will follow mandatory lighting and manning requirements. • Lubuk Tutung water area bed and bank consists largely of mud and sand, which is expected to lessen the risk of potential vessel damage in the event of a grounding.
Communication with Relevant Stakeholders	• Lubuk Tutung Coal Terminal will use two methods to notify vessel pilots of barge operations: Lubuk Tutung Coal Terminal will include barges in its vessel schedule and post this vessel schedule online, such that it is available to the public and whenever a shipping line places an order for berth space, Lubuk Tutung Coal Terminal will notify the pilots and agents of the presence of any coal barges. • Lubuk Tutung Coal Terminal pilots will be aware of the coal barge presence and may order additional tug assist for vessel entry and exit at the Lubuk Tutung Coal Terminal berth face.

Table 4.16 Risk Mitigation Strategies (Continued)

Category	**Risk Management Strategies**
Accident Response	Lubuk Tutung Coal Terminal / Barge operator will: • Contact emergency services, including the coast guard and other relevant agencies, immediately following any accident. • Verify the safety of all vessel occupants and assess the need for first aid or water rescue. • Check coal cargo to ensure it is secure. It is noted that the coal will not be contained in the barge hull, but rather on the barge deck. Therefore, a puncture of the hull would not directly lead to a coal spill.

Those mitigations listed above are to prevent coal spill, if coal spill happened, it should have treatment to clean – up the coal spill. One of the most common treatment that used for clean – up coal spill is called active water treatment (Miningfacts.org, 2012).

Active water treatment aim to removing the contaminants in water area by using physical process (filters or membranes) or by chemical process. Active treatment means that human action is required to keep the treatment actively running.

Mostly, chemicals are used to adjust the pH value of the water to reduce the contamination of metals that polluting the water. Some of the commonly used chemicals are caustic lime, sodium hydroxide, and limestone (Wolkersdorfer, 2006).

CHAPTER V
CONCLUSION

Based on study that had been conducted, carry out data collection and hazard survey in PT. Dire Pratama, calculation of frequency and consequence mapping of the accidents and plotted the calculation to risk acceptance matrix, can show the varied of the results. The conclusions of this bachelor thesis are listed below:

1. Based on hazard survey that had been conducted in October 2016, there are several accidents that could be occur in Lubuk Tutung Coal Terminal water area. The accidents are grounding, collision, spillage, foundered and fire. But, the accidents that considered likely to occur are grounding and collision.
2. The accidents mainly caused by human error, rough environment and equipments failure.
3. Based on the frequency analysis that had been done, all of the accidents are belong to very low category. The accidents are “grounding of barge”, “collision of barge with bulk carrier”, “grounding of bulk carrier” and “collision of barge with coal loading jetty”.
4. Based on the consequence analysis that had been done, it occurred varied results. The level of concequence are varied from low risk to high risk. Concentration on 25 until 20 meters elevation considered as safe risk, since it is below low risk line. In addition, 20 until 17.5 meters elevation considered as low risk, 17.5 until 15 meters elevation considered as medium risk and below 15 meters elevation considered as high risk.
5. Based on the risk analysis that had been done, there is one accident considered as high risk, the accident that

considered as high risk is collision of barge with bulk carrier. Therefore it is necessary to do the mitigation.

6. According to the study that had been done, there are two type of mitigation for coal spill. The first one is mitigation to prevent coal spill. There some preventive mitigations for coal spill, including equipment selection, inspection, operation structure, communication and accident response. Meanwhile, for mitigation if coal spill already happened, could use active water treatment to clean – up the coal spill.

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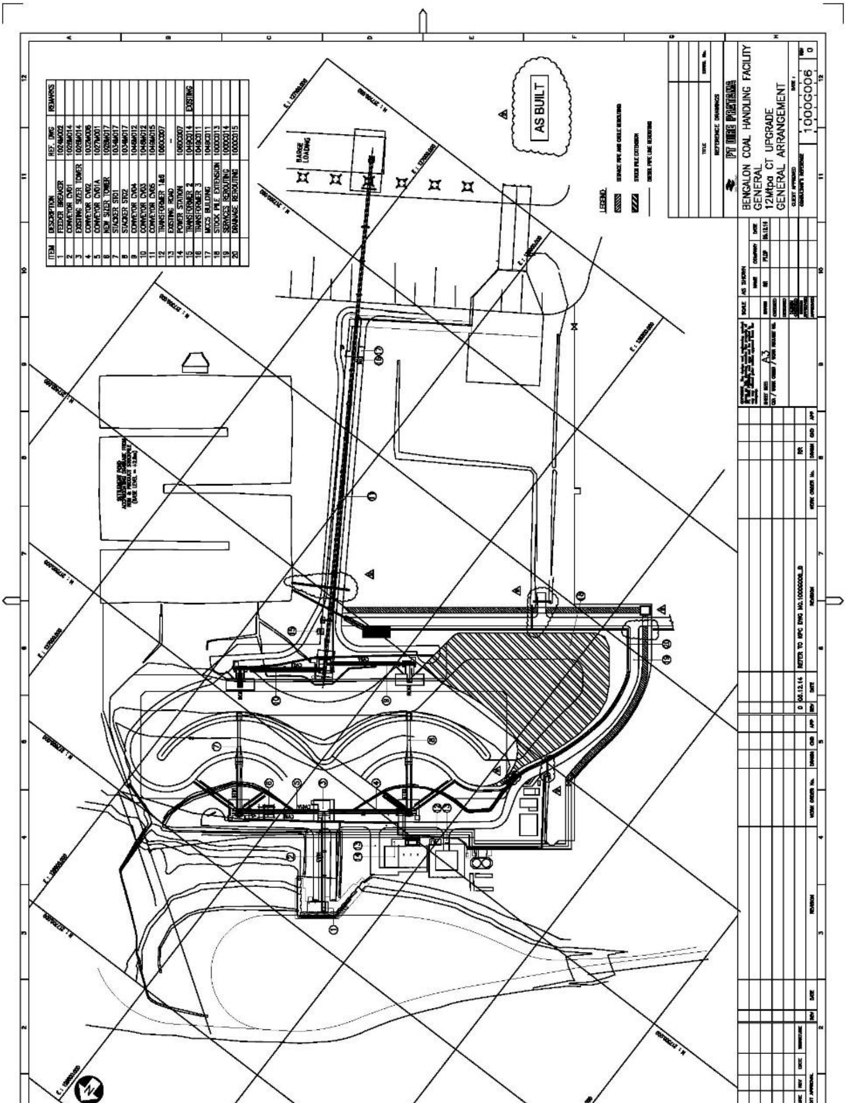
ATTACHMENT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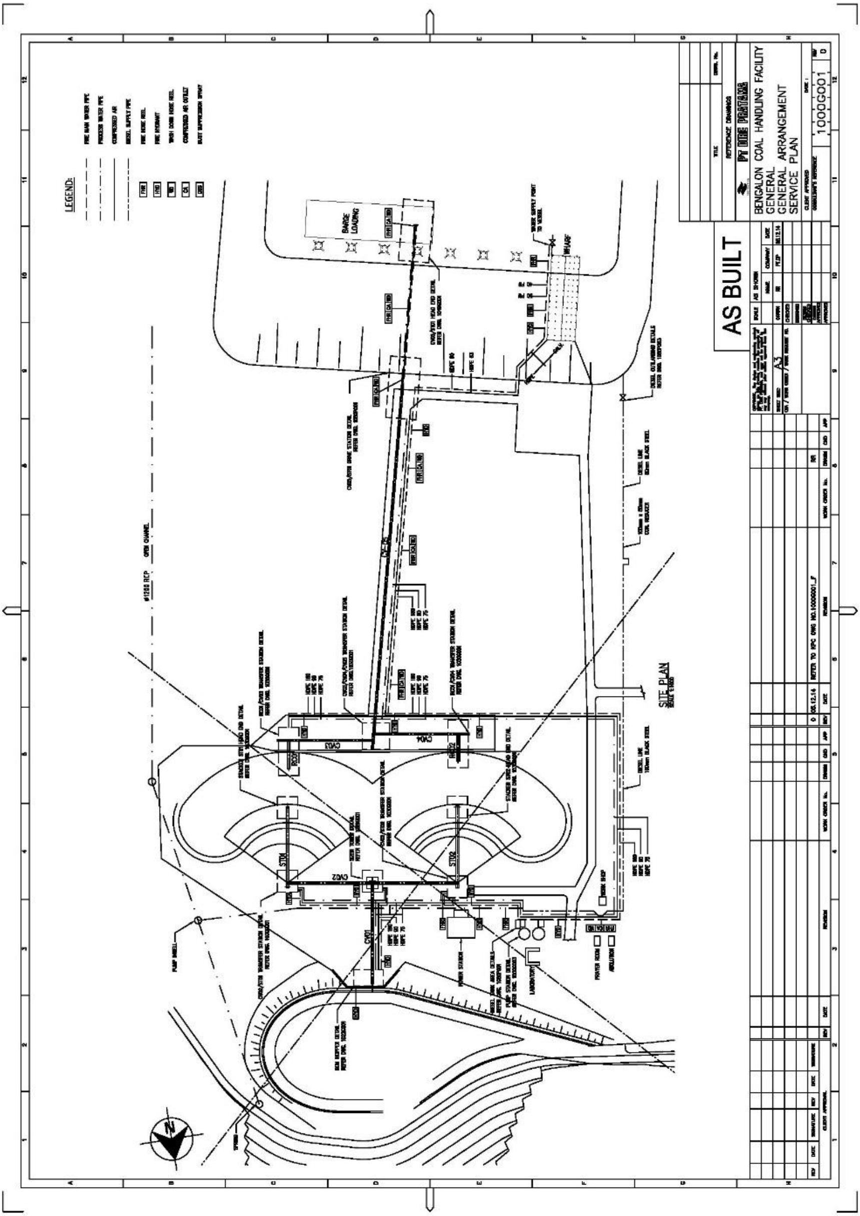
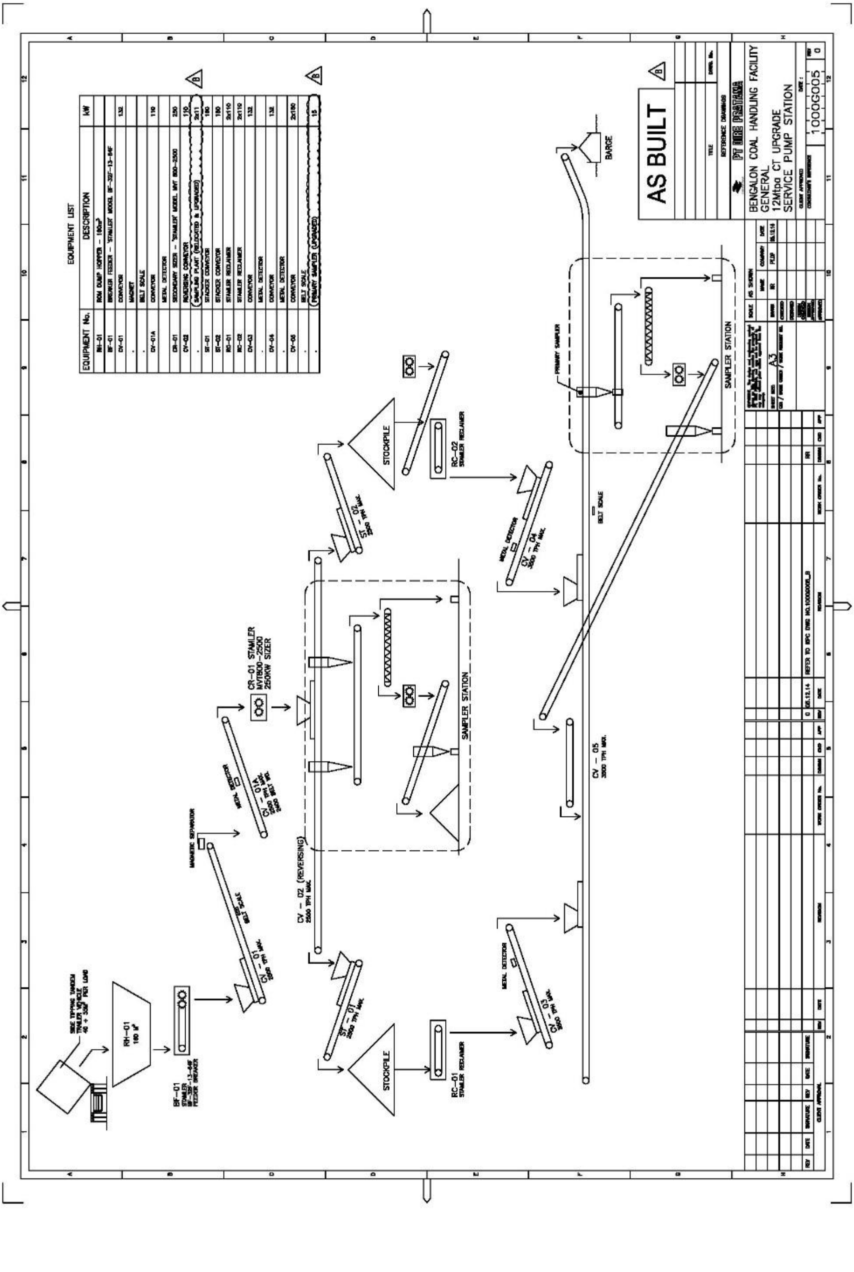
BENGALON COAL HANDLING FACILITY
GENERAL
12Mtpa CT UPGRADE
GENERAL ARRANGEMENT
1000G006


LEGEND:
SITE PLAN
AS BUILT
BENGALON COAL HANDLING FACILITY
GENERAL
GENERAL ARRANGEMENT
SERVICE PLAN
1000G001
BARGE LOADING
WHARF


AS BUILT
BENGALON COAL HANDLING FACILITY
GENERAL
12Mtpa CT UPGRADE
SERVICE PUMP STATION
1000G005
EQUIPMENT LIST
RH-01
160 m³
BF-01
CV - 01
CV - 01A
CR-01 STAMLER
MMT800-2500
250KW SIZER
CV - 02 (REVERSING)
2500 TPH MAX.
SAMPLER STATION
STOCKPILE
RC-01
STAMLER RECLAIMER
RC-02
STAMLER RECLAIMER
CV - 03
CV - 04
CV - 05
3500 TPH MAX.
BARGE

KEMENTERIAN KETENAGAKERJAAN R.I.
LABORATORIUM PENGUJIAN
BALAI KESELAMATAN DAN KESEHATAN KERJA SAMARINDA

LAPORAN HASIL UJI

No. : 040/LHU/BK3-SMR/VII/2016

I. UMUM

1.Nama Perusahaan	: PT.DIRE PRATAMA
2.Alamat Perusahaan	: Lubuk Tutung, Kec. Bengalon - Kab. Kutim
3.Jenis Industri / Usaha	: Pengoperasian & Pengelolaan Pelabuhan Batu Bara
4.Jenis Sampel	: **Udara Ambien**
5.Lokasi Pengukuran	: Area Stockpile
6.Waktu Pengukuran	: 08.58 Wita
7.Tanggal Pengukuran	: 22 Juni 2016
8.No.Registrasi Sampel	: M.045

II. HASIL PENGUJIAN

No.	Parameter	Satuan	Kadar Terukur	Baku Mutu Udara Ambien PP 41 Tahun 1999	Spesifikasi Metode
1.	Karbon Monoksida (CO)	$\mu g/Nm^3$	579,50	30.000	Iodin Pentoksida
2.	Nitrogen Dioksida (NO_2)*	$\mu g/Nm^3$	26,76	400	SNI 19.7119.2-2005
3.	Sulfur Dioksida (SO_2)*	$\mu g/Nm^3$	6,85	900	SNI 19.7119.7-2005
4.	Timbal (Pb)	$\mu g/Nm^3$	< 0,001	2	SNI 19. 7119.4-2005
5.	Oksidan (Ox)	$\mu g/Nm^3$	5,62	235	SNI 19.7115.8-2005
6.	Partikel/Debu	$\mu g/Nm^3$	101,13	230	Gravimetri
7.	Hidrokarbon (HC)	$\mu g/Nm^3$	0,33	160	SNI 7119.13-2009

*Terakreditasi

III. Data Meterologis pada saat pengukuran

No.	Parameter	Satuan	Hasil Pengukuran
1.	Cuaca		Cerah
2.	Suhu Udara	°C	27,1
3.	Kelembaban (RH)	%	74,3
4.	Kecepatan Angin	m/s	0,6 – 1,3
5.	Arah Angin	Ke Utara	

Catatan :
1. Data uji diatas hanya berlaku untuk contoh yang diuji.
2. Laporan Hasil Uji ini tersalin atas satu halaman.
3. Laporan Hasil uji ini tidak boleh digandakan kecuali secara keseluruhan dan atas seijin laboratorium.
4. Laboratorium melayani komplain pelanggan paling lama satu minggu setelah diserahkan Laporan Hasil Uji.
5. Laboratorium menyerahkan rekaman teknis bila diminta oleh pelanggan secara tertulis

Samarinda, Juli 2016
Manajer Teknik,

Heri Purwanto, MSi
NIP. 19680104 199103 1 002

KEMENTERIAN KETENAGAKERJAAN R.I.
LABORATORIUM PENGUJIAN
BALAI KESELAMATAN DAN KESEHATAN KERJA SAMARINDA

L A P O R A N H A S I L U J I
No. : 040/LHU/BK3-SMR/VII/2016

I. UMUM

1. Nama Perusahaan : PT.DIRE PRATAMA
2. Alamat Perusahaan : Lubuk Tutung, Kec. Bengalon - Kab. Kutim
3. Jenis Industri / Usaha : Pengoperasian & Pengelolaan Pelabuhan Batu Bara
4. Jenis Sampel : **Udara Ambien**
5. Lokasi Pengukuran : Dumping Area
6. Waktu Pengukuran : 11.55 Wita
7. Tanggal Pengukuran : 22 Juni 2016
8. No.Registrasi Sampel : M.045

II. HASIL PENGUJIAN

No.	Parameter	Satuan	Kadar Terukur	Baku Mutu Udara Ambien PP 41 Tahun 1999	Spesifikasi Metode
1.	Karbon Monoksida (CO)	$\mu g/Nm^3$	410,52	30.000	Iodin Pentoksida
2.	Nitrogen Dioksida (NO_2)*	$\mu g/Nm^3$	10,18	400	SNI 19.7119.2-2005
3.	Sulfur Dioksida (SO_2)*	$\mu g/Nm^3$	55,44	900	SNI 19.7119.7-2005
4.	Timbal (Pb)	$\mu g/Nm^3$	< 0,001	2	SNI 19. 7119.4-2005
5.	Oksidan (Ox)	$\mu g/Nm^3$	5,78	235	SNI 19.7115.8-2005
6.	Pertikel/Debu	$\mu g/Nm^3$	233,59	230	Gravimetri
7.	Hidrokarbon (HC)	$\mu g/Nm^3$	0,34	160	SNI 7119.13-2009

*Terakreditasi

III. Data Meterologis pada saat pengukuran

No.	Parameter	Satuan	Hasil Pengukuran
1.	Cuaca		Cerah
2.	Suhu Udara	°C	34,8
3.	Kelembaban (RH)	%	64,2
4.	Kecepatan Angin	m/s	0,5 – 2,3
5.	Arah Angin	Ke Utara	

Catatan :
1. Data uji diatas hanya berlaku untuk contoh yang diuji.
2. Laporan Hasil Uji ini tersalin atas satu halaman.
3. Laporan Hasil uji ini tidak boleh digandakan kecuali secara keseluruhan dan atas seijin laboratorium.
4. Laboratorium melayani komplain pelanggan paling lama satu minggu setelah diserahkan Laporan Hasil Uji.
5. Laboratorium menyerahkan rekaman teknis bila diminta oleh pelanggan secara tertulis

Samarinda, Juli 2016
Manajer Teknik,

KEMENTERIAN KETENAGAKERJAAN - DITJEN - REPUBLIK INDONESIA

Heri Purwanto, MSi
NIP. 19680104 199103 1 002

KEMENTERIAN KETENAGAKERJAAN R.I.
LABORATORIUM PENGUJIAN
BALAI KESELAMATAN DAN KESEHATAN KERJA SAMARINDA

LAPORAN HASIL UJI
No. : 040/LHU/BK3-SMR/VII/2016

I. UMUM

1. Nama Perusahaan : PT.DIRE PRATAMA
2. Alamat Perusahaan : Lubuk Tutung, Kec. Bengalon - Kab. Kutim
3. Jenis Industri / Usaha : Pengoperasian & Pengelolaan Pelabuhan Batu Bara
4. Jenis Sampel : **Udara Ambien**
5. Lokasi Pengukuran : Jetty/ Pelabuhan (CV.05)
6. Waktu Pengukuran : 13.35 Wita
7. Tanggal Pengukuran : 22 Juni 2016
8. No.Registrasi Sampel : M.045

II. HASIL PENGUJIAN

No.	Parameter	Satuan	Kadar Terukur	Baku Mutu Udara Ambien PP 41 Tahun 1999	Spesifikasi Metode
1.	Karbon Monoksida (CO)	$\mu g/Nm^3$	2208,63	30.000	Iodin Pentoksida
2.	Nitrogen Dioksida (NO_2)*	$\mu g/Nm^3$	4,44	400	SNI 19.7119.2-2005
3.	Sulfur Dioksida (SO_2)*	$\mu g/Nm^3$	7,52	900	SNI 19.7119.7-2005
4.	Timbal (Pb)	$\mu g/Nm^3$	< 0,001	2	SNI 19. 7119.4-2005
5.	Oksidan (Ox)	$\mu g/Nm^3$	7,32	235	SNI 19.7115.8-2005
6.	Pertikel/Debu	$\mu g/Nm^3$	840,35	230	Gravimetri
7.	Hidrokarbon (HC)	$\mu g/Nm^3$	0,34	160	SNI 7119.13-2009

*Terakreditasi

III. Data Meterologis pada saat pengukuran

No.	Parameter	Satuan	Hasil Pengukuran
1.	Cuaca		Cerah
2.	Suhu Udara	°C	32,3
3.	Kelembaban (RH)	%	66,4
4.	Kecepatan Angin	m/s	0,6 – 2,3
5.	Arah Angin	Ke Utara	

Catatan :
1. Data uji diatas hanya berlaku untuk contoh yang diuji.
2. Laporan Hasil Uji ini tersalin atas satu halaman.
3. Laporan Hasil uji ini tidak boleh digandakan kecuali secara keseluruhan dan atas seijin laboratorium.
4. Laboratorium melayani komplain pelanggan paling lama satu minggu setelah diserahkan Laporan Hasil Uji.
5. Laboratorium menyerahkan rekaman teknis bila diminta oleh pelanggan secara tertulis

Samarinda, Juli 2016
Manajer Teknik,

KEMENTERIAN KETENAGAKERJAAN - DIT. ... REPUBLIK INDONESIA

Heri Purwanto, MSi
NIP. 19680104 199103 1 002

DIRE PRATAMA

PROSEDUR PENGOPERASIAN OUTLOADING

No. : DPMS-OPR-PRO-002
Revisi. 0

DAFTAR ISI **Hal.**

Disiapkan oleh :	Diperiksa oleh :	Disetujui oleh :
01 10 15		
Ahmad Yani	Bambang Saputro	Augustinus Sagala
Senior Process Engineer	Plant Operation Superintendent	Site Manager

Revisi Ke -	Tanggal	Uraian Perubahan
0	06 Juli 2015	Integrasi dokumen mutu, lingkungan dan K3

I. TUJUAN

Prosedur ini digunakan untuk menyediakan metode dan standar kerja Departemen Operation untuk proses operasi *Outloading* secara umum.

II. RUANG LINGKUP

Prosedur ini harus diterapkan khusus untuk aktifitas pengoperasian *Plant Conveyor Outloading* di Pelabuhan batu bara Lubuk tutung

III. REFERENSI

3.1. Standar Sistem Manajemen Mutu ISO 9001:2008 Klausul 7.1. Perencanaan Realisasi Produk, 7.2. Proses yang berkaitan dengan Pelanggan, 7.5.1 Penyediaan Jasa

3.2. Standar Sistem Manajemen Lingkungan ISO 14001:2004 Klausul 4.4.6 Pengendalian Operasional; 4.5.1. Pemantauan dan Pengukuran

3.3. Standar Sistem Manajemen Keselamatan dan Kesehatan Kerja OHSAS 18001:2007 4.4.6 Pengendalian Operasional; 4.5.1 Pengukuran Performa dan Monitoring

3.4. PP No. 50 Tahun 2012 tentang Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja, elemen 6.6 Pelayanan

IV. PERSIAPAN

4.1. Pastikan bahwa power tersedia dan cukup sebelum menjalankan *conveyor*.

4.2. Pastikan bahwa tidak ada orang bekerja di area *conveyor*, saat akan menyalakan *conveyor*.

4.3. Pastikan bahwa koordinasi telah dilakukan sebelum penggunaan *stacker* yang akan digunakan

4.4. Pastikan personel lain tersedia untuk memantau operasi *belt conveyor* dan area *stock pile*.

4.5. Pastikan proses dilakukan dengan baik.

4.6. Komunikasikan pekerjaan yang dilakukan kepada ruang control dan atasan langsung

4.7. *Emergency Management*.

Mengoperasikan unit saat kondisi darurat, seperti adanya kebakaran/ ledakan, huru hara, bencana alam, pencemaran bahan berbahaya, dan lain-lain. Tindakan yang dilakukan adalah:

4.7.1. Melaksanakan prosedur tanggap darurat

4.7.2. Melakukan komunikasi dan koordinasi

4.7.3. Menghubungi pihak berwenang dan terkait lainnya

4.7.4. Melakukan tindakan pencegahan dan perbaikan

V. PROSEDUR

5.1. Pesiapan Kerja

5.1.1. *Operator Control Room* melakukan *pre-start check* ruang kontrol

5.1.2. *Operator Control Room* memastikan semua system computer PLC berfungsi dengan baik.

5.1.3. *Operator Control Room* memastikan semua keperluan lain termasuk alat tulis dan form untuk keperluan laporan sudah tersedia.

5.1.4. *Operator Control Room, Foreman* dan *Supervisor Operation* melakukan koordinasi dengan supervisor jaga mengenai perencanaan operasi *Outloading* dan rencana dari *reclaimer* mana batu bara yang akan dimuat.

5.1.5. *Operator Control Room, Foreman* dan *Supervisor maintenance* melakukan koordinasi / komunikasi dua arah dengan *crew maintenance* untuk memastikan tidak ada pekerjaan *mechanic* atau *electric* di area *Outloading plant conveyor.*

5.1.6. *Operator Control Room* melakukan koordinasi dengan *jetty coordinator* perihal tongkang yang akan sandar dan akan dimuat.

5.1.7. *Operator Control Room* melakukan koordinasi dengan penjaga *power station* perihal kesiapan power / genset

5.1.8. *Operator Control Room* menginformasikan kepada *surveyor* (Pihak ke-3) bahwa *Outloading* akan jalan, akan memuat tongkang.

5.2. Start Conveyor

5.2.1. *Operator Control Room* memastikan indikasi tampilan pada monitor SCADA dan PLC bahwa *plant Outloading* dalam kondisi siap di start.

5.2.2. *Operator Control Room* memberikan informasi kepada maintenance, petugas genset dan supervisor jaga sebagai peringatan bahwa *plant Outloading* akan dijalankan.

5.2.3. *Operator Control Room memonitor Daya Genset*

5.2.4. *Operator Control Room* melakukan start *conveyor* dimulai dari *Conveyor* CV05 sampai dengan *feeder Reclaimer.*

5.2.5. Dalam setiap start 1 *conveyor* harus dipastikan bahwa *conveyor* tersebut telah *running* stabil (konstan) baru *conveyor* berikutnya di start.

5.2.6. Supervisor / Foreman menginformasikan ke Operator Dozer untuk segera menginformasikan dan mengoperasikan unit Dozer sesuai instruksi kerja DPMS-OPR-INST-0130

5.2.7. *Operator Control Room* membuka *rate feeder reclaimer* sesuai standard dan kebutuhan operasional *outloading* yang telah ditentukan yaitu minimum 2500 s/d Max 3000 tph

5.2.8. *Operator Control Room, Supervisor / Foreman Maintenance dan Operation* selalu memonitor perkembangan kondisi *plant Outloading* selama operasi

MASTER

5.3. **Operasional**

5.3.1. *Operator Control Room, Supervisor* dan *Foreman* memastikan *plant Outloading* berjalan dengan lancar. Sesuai **Instruksi Kerja Pengisian Batubara ke Tongkang (DPMS-OPR-INS-0171)**

5.3.2. *Operator Control Room* menjaga komunikasi dengan *Operator Dozer* jika akan menggeser *stacker* atau pendorongan stock batu bara.

5.3.3. *Operator Control Room* memonitor jika terdapat indikasi *fault* atau *safety device* dan segera melaporkan kepada *electric* jaga agar segera dapat teridentifikasi untuk kemudian dilakukan tindakan yang sesuai

5.3.4. *Operator Control Room* dan *Foreman* selalu mengikuti petunjuk dan arahan dari supervisor jaga

5.4. **Pelaporan**

5.3.1. *Supervisor Operation* dan *Operation* membuat laporan produksi jumlah tonase berdasarkan *belt scale* dan *draft survey* juga termasuk *delay* produksi

5.3.2. *Operator Control room* dan *Supervisor* melaporkan kegagalan operasi baik secara *electrical* ataupun *mechanical* ke petugas jaga sesuai **Instruksi Kerja Pemberhentian Inloading dan Outloading untuk Keperluan Perbaikan dan Operasioanal (DPMS-OPR-INS-0166)**

5.3.3. *Supervisor* atau *Foreman Operation* melaporkan hasil perbaikan

5.3.4. *Operator Control Room* dan *Foreman* melakukan *hand over* dengan operator shift berikutnya dengan sedetail mungkin sehubungan dengan *operational Outloading*

5.3.5. *Operator Control room dan foreman* harus melaporkan plant downtime dan low rates sesuai instruksi kerja pengendalin operasi harian (DPMS-OPR-INS-0176)

VI. DOKUMEN TERKAIT

6.1. QHSE Manual PT. Dire Pratama

6.2. DPMS-OPR-INS-0166 Pemberhentian Inloading dan Outloading untuk Keperluan Perbaikan dan Operasioanal Rev.0

6.3. Drawing No. 1000G005 C

VII. DAFTAR ISTILAH

7.1 **Departemen Operation** adalah bagian yang bertanggungjawab dalam persiapan operasi, pengoperasian dan pemantauan operasi

7.2 **Outlloading** adalah Proses produksi yang melibatkan beberapa equipment yaitu Conveyor CV05, CV04, CV03 Reclaimer 01 dan 02 serta Dozer

VIII. LAMPIRAN

-

Certificate No : 00938/BOELAI
Date: August 05, 2016

SUCOFINDO
P-12 Building, Tanjung Bara,
East Kalimantan, Indonesia
Phone: + 62-549-525120, Fax: + 62-549-525214,
E-mail: sucofindo@kpc.co.id

REPORT OF SAMPLING AND ANALYSIS

CLIENT	:	KALTIM PRIMA COAL, PT.
TYPE OF SAMPLE	:	EMISSION AIR
DATE OF SAMPLING	:	June 1, 2016
DATE OF ANALYSIS	:	June 1, 2016 up to June 29, 2016
TESTED FOR	:	SO_2, NO_x, CO, Particulate and Velocity (PermenLH 4/2014 Appendix VI).
NAME OF UNIT EQUIPMENT	:	Genset 01
SAMPLE IDENTIFICATION	:	Location Dire Pratama – Bengalon

Parameter	Unit	Test Result		Environmental Quality Standard	Methods*) Part Number
		Measurement Result	Result after correction		
Sulfur Dioxide (SO_2)	mg/Nm^3	<1	<1	800	US EPA Method 6C
Nitrogen Oxide (NO_x)	mg/Nm^3	1022	932	1000	US EPA Method 7E
Carbon Monoksida (CO)	mg/Nm^3	167	152	600	SNI 19-7117.12-2005
Particulate	mg/Nm^3	15	14	150	SNI 19-7117.12-2005
Velocity	m/s	26.0	26.0	-	Electrometric

Note:
O_2 Normal : 20.9 %
O_2 Correction : 13 %
O_2 Measurement : 12.22 %

PT. Sucofindo (Persero)

Tamrin

6101021600507

2300985
SCI-2007A

Certificate No : 00939/BOELAJ
Date: August 05, 2016

SUCOFINDO
P-12 Building, Tanjung Bara,
East Kalimantan, Indonesia
Phone: + 62-549-525120, Fax: + 62-549-525214,
E-mail: sucofindo@kpc.co.id

REPORT OF SAMPLING AND ANALYSIS

CLIENT	:	KALTIM PRIMA COAL, PT.
TYPE OF SAMPLE	:	EMISSION AIR
DATE OF SAMPLING	:	June 1, 2016
DATE OF ANALYSIS	:	June 1, 2016 up to June 29, 2016
TESTED FOR	:	SO_2, NO_x, CO, Particulate and Velocity (PermenLH 4/2014 Appendix VI).
NAME OF UNIT EQUIPMENT	:	Genset 02
SAMPLE IDENTIFICATION	:	Location Dire Pratama – Bengalon

Parameter	Unit	Test Result		Environmental Quality Standard	Methods*) Part Number
		Measurement Result	Result after correction		
Sulfur Dioxide (SO_2)	mg/Nm^3	<1	<1	800	US EPA Method 6C
Nitrogen Oxide (NO_x)	mg/Nm^3	1212	982	1000	US EPA Method 7E
Carbon Monoksida (CO)	mg/Nm^3	161	130	600	SNI 19-7117.12-2005
Particulate	mg/Nm^3	8	7	150	SNI 19-7117.12-2005
Velocity	m/s	4.3	4.3	-	Electrometric

Note:
O_2 Normal : 20.9 %
O_2 Correction : 13 %
O_2 Measurement : 11.12 %

PT. Sucofindo (Persero)

6101021600507

2300986

SCI-2007A

[redacted]

Certificate No : 00940/BOELAJ
Date: August 05, 2016

SUCOFINDO
P-12 Building, Tanjung Bara,
East Kalimantan, Indonesia
Phone: + 62-549-525120, Fax: + 62-549-525214,
E-mail: sucofindo@kpc.co.id

REPORT OF SAMPLING AND ANALYSIS

CLIENT	:	KALTIM PRIMA COAL, PT.
TYPE OF SAMPLE	:	EMISSION AIR
DATE OF SAMPLING	:	June 1, 2016
DATE OF ANALYSIS	:	June 1, 2016 up to June 29, 2016
TESTED FOR	:	SO_2, NO_x, CO, Particulate and Velocity (PermenLH 4/2014 Appendix VI).
NAME OF UNIT EQUIPMENT	:	Genset 03
SAMPLE IDENTIFICATION	:	Location Dire Pratama – Bengalon

Parameter	Unit	Test Result		Environmental Quality Standard	Methods*) Part Number
		Measurement Result	Result after correction		
Sulfur Dioxide (SO_2)	mg/Nm^3	<1	<1	800	US EPA Method 6C
Nitrogen Oxide (NO_x)	mg/Nm^3	1207	991	1000	US EPA Method 7E
Carbon Monoksida (CO)	mg/Nm^3	144	118	600	SNI 19-7117.12-2005
Particulate	mg/Nm^3	21	17	150	SNI 19-7117.12-2005
Velocity	m/s	5.4	5.4	-	Electrometric

Note:
O_2 Normal : 20.9 %
O_2 Correction : 13 %
O_2 Measurement * : 11.26 %

PT. Sucofindo (Persero)

Tamrin

6101021600507

2300987

SCI-2007A

ECOCOAL COAL QUALITY			
	Typical	**Minimum**	**Maximum**
TOTAL MOISTURE, % as received basis	35,0	23,0	42,0
PROXIMATE ANALYSIS, % air dried basis			
Moisture	21,5	15,0	28,0
Ash	5,5	4,0	8,0
Volatile Matter	38,0	35,0	42,0
Fixed Carbon	35,0	30,0	40,0
CALORIFIC VALUE, kcal/kg			
Gross air dried	5000	4800	5250
Gross as received	4140	4000	4400
Net as received	3784	3600	4100
HGI	60	50	70
ULTIMATE ANALYSIS, % dry ash free basis			
Carbon	72,5	70,0	76,0
Hydrogen	4,90	4,00	5,50
Nitrogen	1,03	0,80	1,30
Sulfur	0,55	0,25	0,90
Oxygen	21,1	18,5	24,5
SULFUR, % air dried basis	0,40	0,20	0,80
CHLORINE, % air dried basis	<0.01	<0.01	0,01
PHOSPHORUS, % dry basis in coal	0,015	0,003	0,010

ASH FUSION TEMPERATURE, ^{o}C			
	Reducing		
Initial Deformation	1150	1100	1250
Spherical	1170	1120	1250
Hemispherical	1200	1130	1400
Flow	1230	1180	1600
	Oxidizing		
Initial Deformation	1190	1100	1250
Spherical	1210	1130	1300
Hemispherical	1210	1130	1300
Flow	1240	1180	1600
ASH ANALYSIS, % dry basis in ash			
SiO_2	45,0	5,0	60,0
Al_2O_3	16,0	3,0	30,0
Fe_2O_3	12,5	4,0	30,0
CaO	8,00	3,00	15,00
MgO	8,00	3,00	15,00
TiO_2	1,00	0,40	4,00
Na_2O	0,20	0,05	2,00
K_2O	0,60	0,20	2,00
P_2O_5	0,50	0,05	1,00
SO_3	8,20	6,00	15,00
SIZING, %			
Above 50 mm	2,0	0,0	5,0
Under 2 mm	20,0	10,0	30,0
According to ISO methods, except HGI, Trace Elements and Ash Analysis to ASTM			

Date	Time (WITA)	Condition		pH Result (6-9)	Rainfall (mm)	Water Level (cm)	Debit (m3/s)	Remark
		Water	Weather					
1	15,00	Jernih	Cerah	8,05	0	2	0,0077	Air keluar menuju laut
2	8,00	Jernih	Cerah	7,80	0	2	0,0077	Air keluar menuju laut
3	16,00	Jernih	Cerah	7,50	12	2	0,0077	Air keluar menuju laut
4	16,00	Jernih	Cerah	7,80	0	2	0,0077	Air keluar menuju laut
5	8,30	Jernih	Cerah	7,92	0	2	0,0077	Air keluar menuju laut
6	8,00	Jernih	Cerah	7,90	0	2	0,0077	Air keluar menuju laut
7	16,00	Jernih	Cerah	7,87	5	1	0,0024	Air keluar menuju laut
8	16,00	Jernih	Cerah	7,43	0	1	0,0024	Air keluar menuju laut
9	8,00	Jernih	Cerah	7,24	0	1	0,0024	Air keluar menuju laut
10	15,30	Jernih	Cerah	7,30	7	2	0,0077	Air keluar menuju laut
11	8,00	Jernih	Mendung	7,50	12	2	0,0077	Air keluar menuju laut
12	16,00	Jernih	Cerah	7,75	9	4	0,0241	Air keluar menuju laut
13	9,50	Jernih	Hujan	7,94	52	20	0,3163	Air keluar menuju laut
14	9,00	Jernih	Mendung	7,85	0	2	0,0077	Air keluar menuju laut
15	9,00	Jernih	Mendung	7,76	15	2	0,0077	Air keluar menuju laut
16	8,30	Jernih	Cerah	7,67	0	2	0,0077	Air keluar menuju laut
17	9,10	Jernih	Mendung	7,83	12	2	0,0077	Air keluar menuju laut
18	8,15	Jernih	Cerah	7,20	0	2	0,0077	Air keluar menuju laut
19	9,00	Jernih	Berawan	6,91	5	2	0,0077	Air keluar menuju laut
20	8,00	Jernih	Cerah	6,95	0	2	0,0077	Air keluar menuju laut
21	8,00	Jernih	Cerah	7,10	0	2	0,0077	Air keluar menuju laut
22	8,00	Jernih	Cerah	7,05	0	2	0,0077	Air keluar menuju laut
23	8,00	Jernih	Cerah	7,02	0	2	0,0077	Air keluar menuju laut
24	8,00	Jernih	Cerah	6,95	0	2	0,0077	Air keluar menuju laut
25	8,00	Jernih	Cerah	7,00	0	2	0,0077	Air keluar menuju laut
26	8,00	Jernih	Cerah	7,00	0	2	0,0077	Air keluar menuju laut
27	8,00	Jernih	Cerah	7,62	22	2	0,0077	Air keluar menuju laut
28	8,00	Jernih	Cerah	7,76	0	2	0,0077	Air keluar menuju laut
29	8,00	Jernih	Cerah	7,83	0	2	0,0077	Air keluar menuju laut
30	8,00	Jernih	Cerah	7,25	8	2	0,0077	Air keluar menuju laut

DAY	Total Cargo From PIT + Total Cargo from ROM	INLOAD - Belt Scale CV01 (TON)	Flow Rate Inloading (TPH)	Target Flow rate Inloading
1	28.231	26.497	1.522	1.800
2	31.581	34.316	1.525	1.800
3	27.573	32.640	1.541	1.800
4	31.953	35.274	1.540	1.800
5	24.066	26.967	1.365	1.800
6	20.587	23.431	1.248	1.800
7	30.241	31.424	1.555	1.800
8	25.402	28.740	1.522	1.800
9	27.807	29.000	1.473	1.800
10	19.038	18.218	1.247	1.800
11	21.517	23.549	1.282	1.800
12	21.517	19.871	1.389	1.800
13	23.928	27.037	1.453	1.800
14	28.259	31.177	1.456	1.800
15	23.955	27.932	1.559	1.800
16	21.457	23.322	1.491	1.800
17	32.057	32.859	1.561	1.800
18	33.579	34.407	1.619	1.800
19	30.462	31.611	1.539	1.800
20	25.476	26.368	1.537	1.800
21	322	904	452	1.800
22	25.216	28.159	1.577	1.800
23	32.315	33.815	1.486	1.800
24	34.150	36.134	1.559	1.800
25	18.527	20.038	1.409	1.800
26	4.710	5.150	1.626	1.800
27	29.469	30.020	1.540	1.800
28	22.843	23.988	1.530	1.800
29	28.912	32.664	1.490	1.800
30	23.350	26.526	1.429	1.800

OUTLOAD - Belt Scale CV05 (TON)	OUTLOAD - Draft Survey (TON)	Flow Rate Outloading (TPH)	Target Flow rate Outloading
27.519	27.741	1.752	2.500
16.770	16.246	2.003	2.500
	-	-	2.500
8.035	8.003	2.242	2.500
9.118	8.853	2.545	2.500
24.461	24.015	2.296	2.500
34.359	34.302	2.379	2.500
23.365	23.936	2.477	2.500
24.338	23.944	2.718	2.500
13.077	13.323	1.618	2.500
19.463	19.512	1.849	2.500
26.489	26.255	2.323	2.500
22.363	22.353	1.965	2.500
26.409	26.652	2.113	2.500
38.063	38.546	2.430	2.500
36.146	36.127	2.202	2.500
33.300	33.702	1.998	2.500
35.048	35.376	2.070	2.500
7.360	7.345	2.387	2.500
28.095	27.970	2.244	2.500
9.573	10.124	1.336	2.500
26.400	26.523	1.793	2.500
20.691	20.685	2.007	2.500
32.835	32.822	1.941	2.500
16.738	16.487	1.940	2.500
6.000	6.000	1.333	2.500
21.815	21.913	2.006	2.500
35.491	36.066	2.532	2.500
27.847	28.261	1.966	2.500
23.542	22.661	2.125	2.500

Consequence Risk Matrix

	HEALTH CONSEQUENCES	SAFETY CONSEQUENCES	PROPERTY DAMAGE CONSEQUENCE	PRODUCTION CONSEQUENCE	ENVIRONMENTAL CONSEQUENCES
1	Long term chronic health effects to workers or public with potential for death	Fatality (Fatality, multiple fatality; major permanent disability)	Property Damage / >$ US 500k	More than 1week delay production	Large-scale, long-term environmental damage offsite and / or a compliance breach that threatens continued operation
2	Long term chronic health effects to workers or public with major impact on body function / lifestyle	LDI (Serious injury and hospitalization; permanent disability)	Property Damage / > $ US 100 – 500 K	3 – 6 day delay production	Large-scale, short-term environmental damage offsite and / or a compliance breach sanction
3	Chronic health effects causing partial impact on body function	RWDI (Minor loss of body part / function; LTI)	Property Damage / > $ US 50 – 100 k	1 – 3 day delay production	Small-scale environmental damage offsite and / or a reportable compliance breach
4	Health impact requiring medical treatment / intervention; not permanent	Medical treatment (Treatment that **must** be given by a doctor)	Property Damage / $ US 1 – 50 k	1 – 3 shift delay production	Significant environmental damage onsite only and / or a technical compliance breach
5	Transitory health impact	Minor impact (First aid treatment)	Property Damage < $ US 1000	1 shift delay production	Minor environmental impact and / or a technical compliance breach

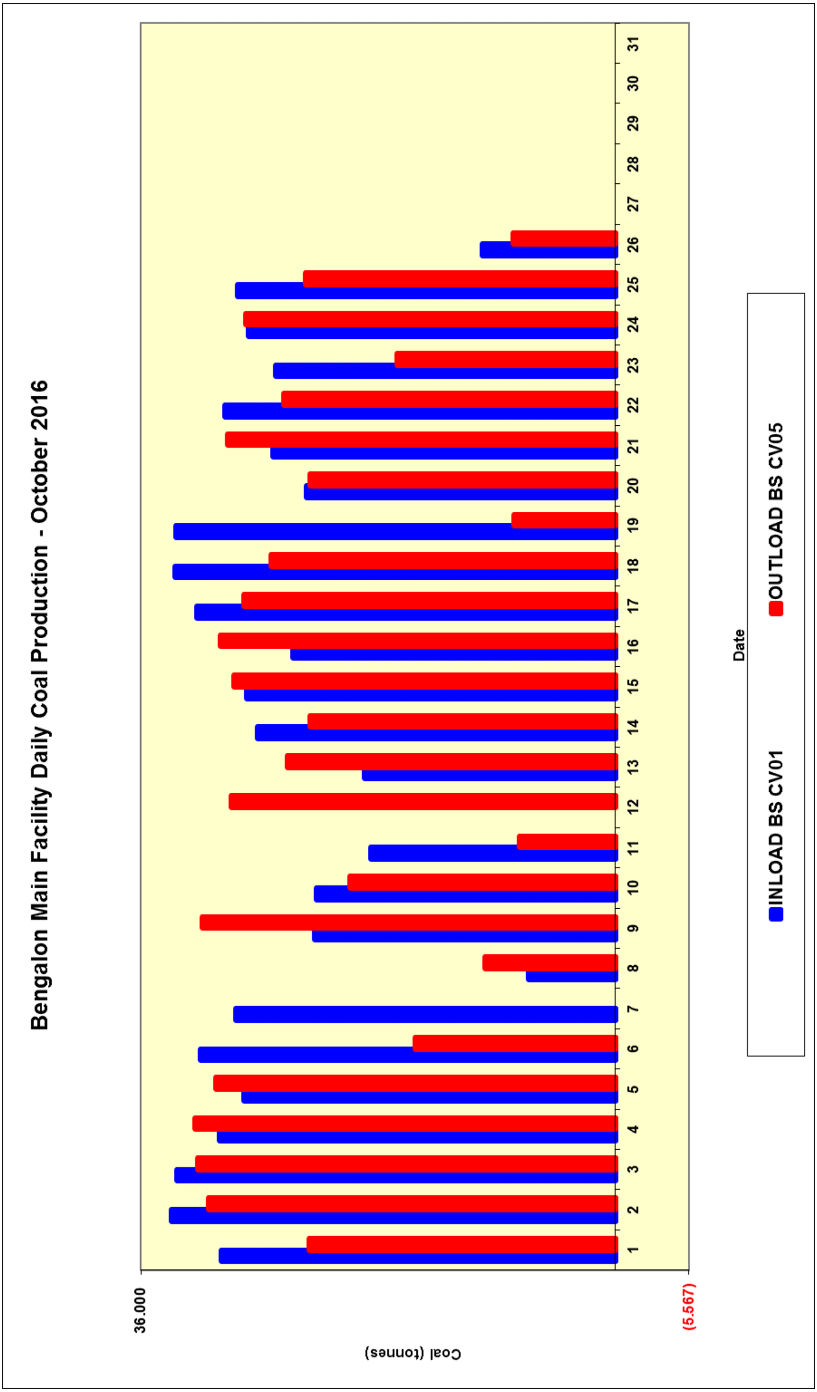
LIKELIHOOD OF SPECIFIED CONSEQUENCES				
A Many times per year	B Once or twice per year	C Once in 5 years	D Once in approx. 15 years	E Unlikely in life of mine
1 SIGNIFICANT	2 SIGNIFICANT	4 SIGNIFICANT	7 HIGH	11 HIGH
3 SIGNIFICANT	5 SIGNIFICANT	8 HIGH	12 HIGH	16 MEDIUM
6 HIGH	9 HIGH	13 MEDIUM	17 MEDIUM	20 LOW
10 HIGH	14 MEDIUM	18 LOW	21 LOW	23 LOW
15 MEDIUM	19 LOW	22 LOW	24 LOW	25 LOW

Sediment Concentration Profile Calculated Using Dyer Equation

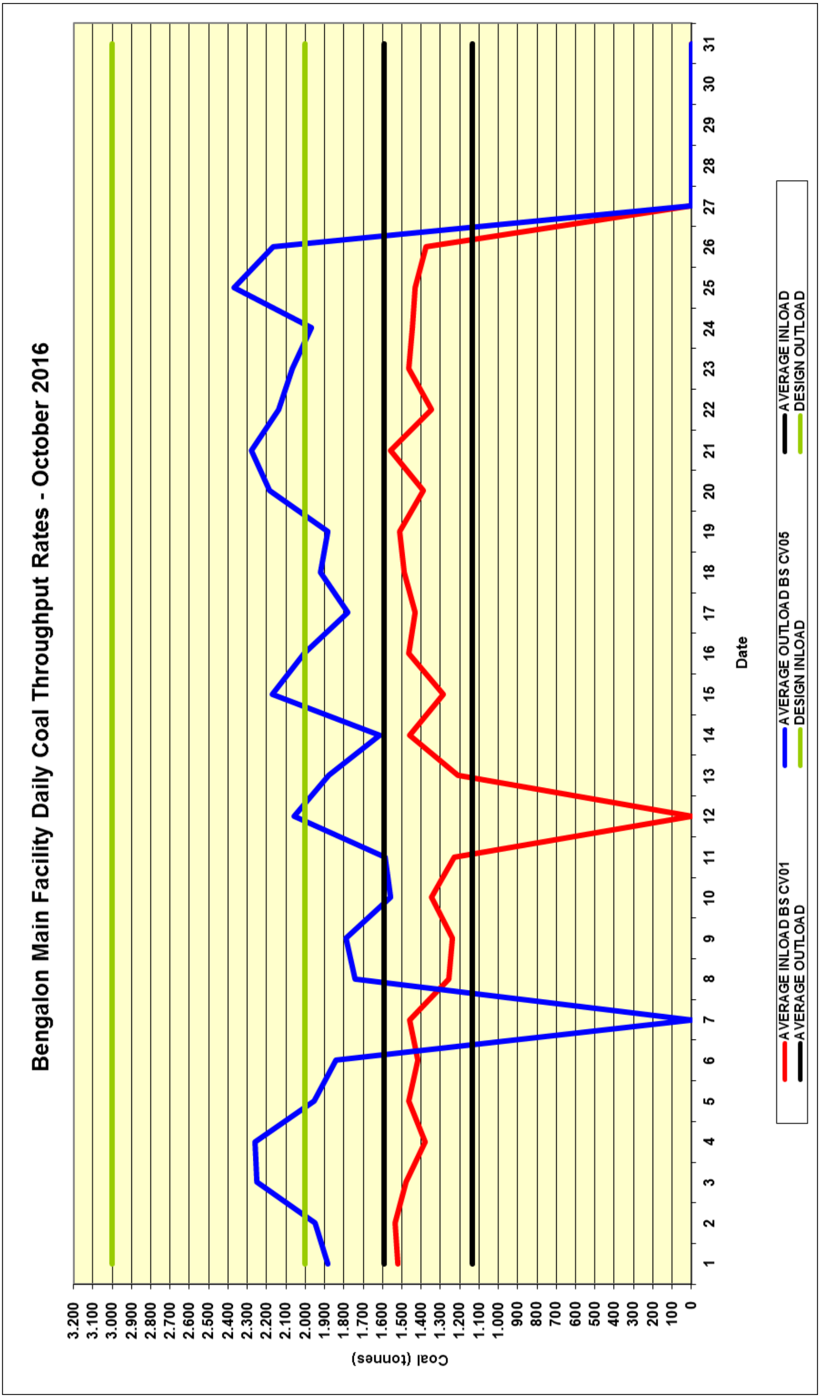
Elevation (m)	Ref. Concentration	Ref. Elevation	Water depth	Coefficient β	Von Karman constant	Particle settling velocity	Shear velocity	Concentration at the height
25	260	8	25	1	0,4	1	0,52	1588,394011
24	260	8	25	1	0,4	1	0,52	1508,589687
23	260	8	25	1	0,4	1	0,52	1428,070759
22	260	8	25	1	0,4	1	0,52	1346,930811
21	260	8	25	1	0,4	1	0,52	1265,280712
20	260	8	25	1	0,4	1	0,52	1183,251149
19	260	8	25	1	0,4	1	0,52	1100,995493
18	260	8	25	1	0,4	1	0,52	1018,693075
17	260	8	25	1	0,4	1	0,52	936,5528885
16	260	8	25	1	0,4	1	0,52	854,8177765
15	260	8	25	1	0,4	1	0,52	773,7691304
14	260	8	25	1	0,4	1	0,52	693,7321182
13	260	8	25	1	0,4	1	0,52	615,0814357

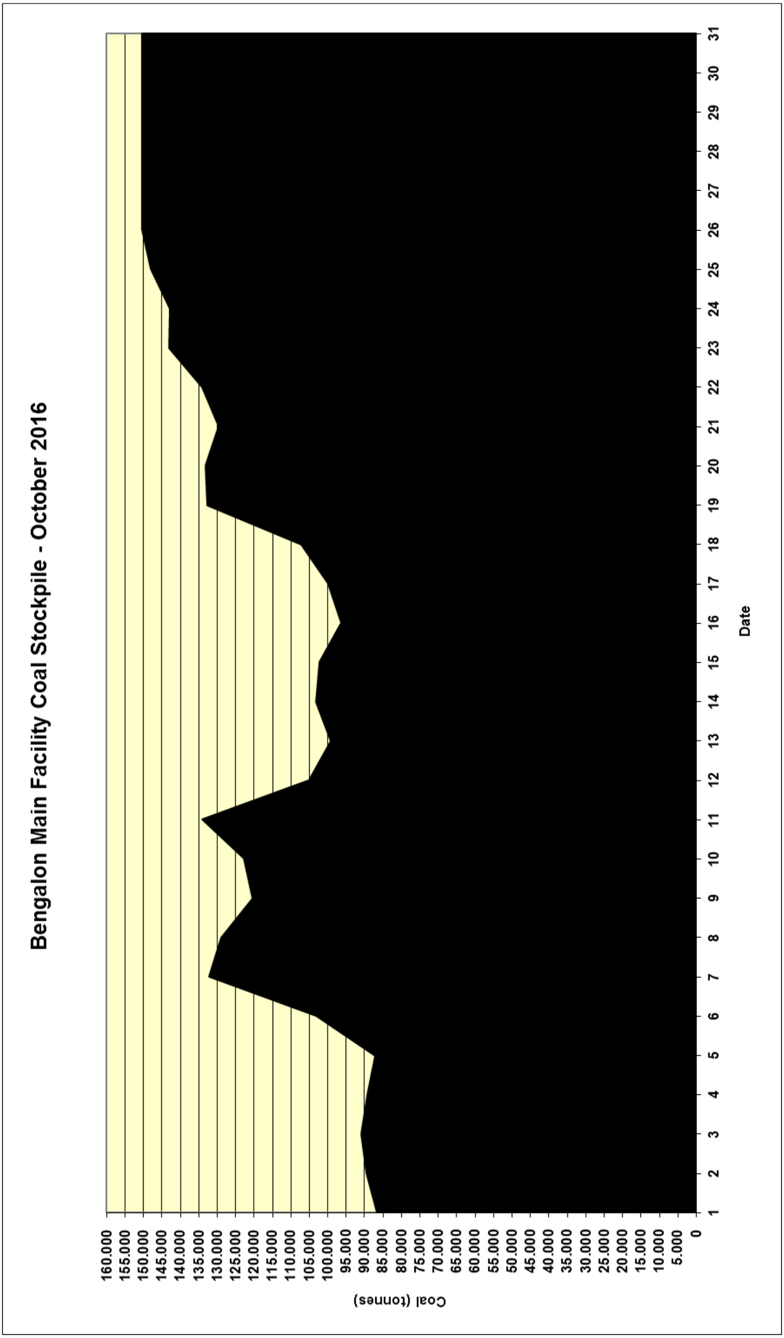
Sediment Concentration Profile Calculated Using Dyer Equation (Continued)

12	260	8	25	1	0,4	1	0,52	538,2475171
11	260	8	25	1	0,4	1	0,52	463,723058
10	260	8	25	1	0,4	1	0,52	392,0695546
9	260	8	25	1	0,4	1	0,52	323,9233171
8	260	8	25	1	0,4	1	0,52	260
7	260	8	25	1	0,4	1	0,52	201,0959779
6	260	8	25	1	0,4	1	0,52	148,0836538
5	260	8	25	1	0,4	1	0,52	101,8955233
4	260	8	25	1	0,4	1	0,52	63,48749823
3	260	8	25	1	0,4	1	0,52	33,7630202
2	260	8	25	1	0,4	1	0,52	13,41834052
1	260	8	25	1	0,4	1	0,52	2,606752869
0	260	8	25	1	0,4	1	0,52	0



Bengalon Main Facility Daily Coal Production - October 2016
Coal (tonnes)
36.000
(5.567)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Date
INLOAD BS CV01
OUTLOAD BS CV05


Bengalon Main Facility Daily Coal Throughput Rates - October 2016
Coal (tonnes)
Date
AVERAGE INLOAD BS CV01
AVERAGE OUTLOAD
AVERAGE OUTLOAD BS CV05
DESIGN INLOAD
AVERAGE INLOAD
DESIGN OUTLOAD


Bengalon Main Facility Coal Stockpile - October 2016
Coal (tonnes)
Date

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	13.462	1.599	16.457	1.464	29.919	1.522
Outloading-CV05	7.712	1.851	15.513	1.900	23.225	1.883
Inloading-TC	12.280	1.459	13.885	1.235	26.165	1.331
Outloading-DS	7.561	1.815	15.670	1.919	23.231	1.884

Belt Scale CV-01	start	46.949.471,0		109,6%	
	finish	46.962.933,0		13.462,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	19	1.045	PMR 7 3051		
PMR 2	22	1.122	BUMA LDR	14	84
PMR 3			DMP L220		
PMR 4	51	4.692	PMR 1 (Biru)		
PMR 5			PMR 2	5	275
PMR 6			PMR 3 (Putih)		
BUMA1	37	4.144	Other		
BUMA 2	9	918	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		11.921	Total Cargo from ROM		359
Delays	Mechanic				hrs
	Electric			0,92	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	SM		2,00	hrs
	Dump Hopper Empty			0,67	hrs
Total Down Time				3,58	hrs
Total Effective Operating Time				8,42	hrs
Net Inloading Rates				1.599	tph

Belt Scale CV-01	start	**46.962.933,0**		**118,5%**	
	finish	**46.979.390,0**		**16.457,0**	
		TONNES	**ROM PAD**		**TONNES**
PMR 1	**33**	**1.815**	PMR 7 3051		
PMR 2	**20**	**1.020**	BUMA LDR	**21**	**126**
PMR 3			DMP L220		
PMR 4	**48**	**4.416**	PMR 1 (Biru)		
PMR 5			PMR 2	**30**	
PMR 6			PMR 3 (Putih)		
BUMA1	**49**	**5.488**	Other		
BUMA 2	**10**	**1.020**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**13.759**	Total Cargo from ROM		**126**
Delays	Mechanic			**0,17**	hrs
	Electric			**0,17**	hrs
	Operation			**0,17**	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			**0,25**	hrs
Total Down Time				**0,76**	hrs
Total Effective Operating Time				**11,24**	hrs
Net Inloading Rates				**1.464**	tph

BARGE NAMES		**TCP 3003**			**Total**
Belt Scale CV-05	Start	**3.052.335,0**	**3.060.047,0**	**3.060.047,0**	
	Finish	**3.060.047,0**	**3.060.047,0**	**3.060.047,0**	
	Total belt scale	**7.712,0**			**7.712,0**
TOTAL DRAFT SURVEY		**7.561,0**			**7.561,0**
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	**0,50**			**0,50**
	Empty Barge	**7,25**			**7,25**
Total Down Time		**0,50**			**0,50**
Total Operating Time		**4,67**			**4,67**
Total Effective Operating Time		**4,17**			**4,17**
Net Outloading rates		**1.851**			**1.851**

BARGES NAMES		Diamond 3002	L. Mutiara		Total
Belt Scale CV-05	Start	3.060.047,0	3.067.655,0	3.075.560,0	
	Finish	3.067.655,0	3.075.560,0	3.075.560,0	
	Total belt scale	7.608,0	7.905,0		15.513,0
TOTAL DRAFT SURVEY		7.723,0	7.947,0		15.670,0
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector	0,25	0,17		0,42
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge	1,92	0,83		2,75
Total Down Time		0,25	0,17		0,42
Total Operating Time		3,83	4,00	0,75	8,58
Total Effective Operating Time		3,58	3,83	0,75	8,17
Net Outloading rates		2.123	2.062		1.900

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	17.470	1.576	16.190	1.494	33.660	1.536
Outloading-CV05	15.965	2.254	14.918	1.705	30.883	1.951
Inloading-TC	16.410	1.481	14.054	1.297	30.464	1.390
Outloading-DS	16.109	2.274	15.072	1.723	31.181	1.969

Belt Scale CV-01	start	46.979.390,0		106,5%	
	finish	46.996.860,0		17.470,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	27	1.485	PMR 7 3051		
PMR 2	16	816	BUMA LDR	34	204
PMR 3			DMP L220		
PMR 4	58	5.336	PMR 1 (Biru)	9	315
PMR 5			PMR 2	26	1.430
PMR 6			PMR 3 (Putih)		
BUMA1	50	5.600	Other		
BUMA 2	12	1.224	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		14.461	Total Cargo from ROM		1.949
Delays	Mechanic				hrs
	Electric				hrs
	Operation			0,17	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,75	hrs
Total Down Time				0,92	hrs
Total Effective Operating Time				11,08	hrs
Net Inloading Rates				1.576	tph

Belt Scale CV-01	start	46.996.860,0		115,2%	
	finish	47.013.050,0		16.190,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	25	1.375	PMR 7 3051		
PMR 2	21	1.071	BUMA LDR		
PMR 3			DMP L220		
PMR 4	55	5.060	PMR 1 (Biru)	8	280
PMR 5			PMR 2	6	330
PMR 6			PMR 3 (Putih)		
BUMA1	43	4.816	Other		
BUMA 2	11	1.122	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		13.444	Total Cargo from ROM		610
Delays	Mechanic			0,83	hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,33	hrs
Total Down Time				1,17	hrs
Total Effective Operating Time				10,83	hrs
Net Inloading Rates				1.494	tph

BARGE NAMES		Diamond O	TCP 3005	Diamond A	Total
Belt Scale CV-05	Start	3.075.560,0	3.083.319,0	3.091.225,0	
	Finish	3.083.319,0	3.091.225,0	3.091.525,0	
	Total belt scale	7.759,0	7.906,0	300,0	15.965,0
TOTAL DRAFT SURVEY		7.712,0	8.097,0	300,0	16.109,0
Delays	Mechanic				
	Electric		0,17		0,2
	Operation				
	Metal detector		0,17		0,2
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,50	0,50		1,0
	Empty Barge	2,25	1,08	0,92	4,3
Total Down Time		0,50	0,83		1,3
Total Operating Time		4,00	4,25	0,17	8,4
Total Effective Operating Time		3,50	3,42	0,17	7,1
Net Outloading rates		2.217	2.314	1.800	2.254

BARGES NAMES		Diamond A	TCP 3002		Total
Belt Scale CV-05	Start	3.091.525,0	3.099.018,0	3.106.443,0	
	Finish	3.099.018,0	3.106.443,0	3.106.443,0	
	Total belt scale	7.493,0	7.425,0		14.918,0
TOTAL DRAFT SURVEY		7.562,0	7.510,0		15.072,0
Delays	Mechanic				
	Electric				
	Operation	0,83			0,8
	Metal detector				
	Weather				
	Waiting Cargo				
	Other	1,50			1,5
	Barge Shifting				
	Empty Barge		0,92		0,9
Total Down Time		2,33			2,3
Total Operating Time		6,58	4,50		11,1
Total Effective Operating Time		4,25	4,50		8,8
Net Outloading rates		1.763	1.650		1.705

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	16.022	1.446	17.244	1.510	33.266	1.478
Outloading-CV05	17.103	2.332	14.594	2.162	31.697	2.251
Inloading-TC	15.220	1.373	16.475	1.443	31.695	1.409
Outloading-DS	17.136	2.337	14.720	2.181	31.856	2.262

Belt Scale CV-01	start	47.013.050,0		105,3%	
	finish	47.029.072,0		16.022,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	20	1.100	PMR 7 3051		
PMR 2	23	1.173	BUMA LDR	32	192
PMR 3			DMP L220		
PMR 4	50	4.600	PMR 1 (Biru)	3	105
PMR 5			PMR 2	26	1.430
PMR 6			PMR 3 (Putih)		
BUMA1	50	5.600	Other		
BUMA 2	10	1.020	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		13.493	Total Cargo from ROM		1.727
Delays	Mechanic			0,17	hrs
	Electric			0,42	hrs
	Operation			0,17	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,17	hrs
Total Down Time				0,92	hrs
Total Effective Operating Time				11,08	hrs
Net Inloading Rates				1.446	tph

Belt Scale CV-01	start	47.029.072,0		104,7%	
	finish	47.046.316,0		17.244,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	25	1.375	PMR 7 3051		
PMR 2	24	1.224	BUMA LDR	34	204
PMR 3			DMP L220		
PMR 4	61	5.612	PMR 1 (Biru)		
PMR 5			PMR 2	26	1.430
PMR 6			PMR 3 (Putih)		
BUMA1	51	5.712	Other		
BUMA 2	9	918	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		14.841	Total Cargo from ROM		1.634
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,58	hrs
Total Down Time				0,58	hrs
Total Effective Operating Time				11,42	hrs
Net Inloading Rates				1.510	tph

BARGE NAMES		TCP 3001	Diamond 3003	TCP 3005	Total
Belt Scale CV-05	Start	3.106.443,0	3.114.574,0	3.122.046,0	
	Finish	3.114.574,0	3.122.046,0	3.123.546,0	
	Total belt scale	8.131,0	7.472,0	1.500,0	17.103,0
TOTAL DRAFT SURVEY		8.182,0	7.454,0	1.500,0	17.136,0
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,50	0,50		1,0
	Empty Barge	1,25	1,08	1,08	3,4
Total Down Time		0,50	0,50		1,0
Total Operating Time		4,00	3,58	0,75	8,3
Total Effective Operating Time		3,50	3,08	0,75	7,3
Net Outloading rates		2.323	2.423	2.000	2.332

BARGES NAMES		TCP 3005	Diamond C		Total
Belt Scale CV-05	Start	3.122.046,0	3.128.715,0	3.136.640,0	
	Finish	3.128.715,0	3.136.640,0	3.136.640,0	
	Total belt scale	6.669,0	7.925,0		14.594,0
TOTAL DRAFT SURVEY		6.725,0	7.995,0		14.720,0
Delays	Mechanic				
	Electric				
	Operation	1,00			1,0
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting		0,17		0,2
	Empty Barge		1,08		1,1
Total Down Time		1,00	0,17		1,2
Total Operating Time		4,25	3,67		7,9
Total Effective Operating Time		3,25	3,50		6,8
Net Outloading rates		2.052	2.264		2.162

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	14.830	1.299	15.217	1.473	30.047	1.381
Outloading-CV05	16.065	2.295	15.788	2.229	31.853	2.262
Inloading-TC	13.587	1.190	13.767	1.332	27.354	1.258
Outloading-DS	16.385	2.341	16.113	2.275	32.498	2.308

	start	47.046.316,0		109,1%	
	finish	47.061.146,0		14.830,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	13	715	PMR 7 3051		
PMR 2	13	663	BUMA LDR	19	114
PMR 3			DMP L220		
PMR 4	53	4.876	PMR 1 (Biru)	27	945
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	46	5.152	Other		
BUMA 2	11	1.122	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		12.528	Total Cargo from ROM		1.059
Delays	Mechanic			0,33	hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,25	hrs
Total Down Time				0,58	hrs
Total Effective Operating Time				11,42	hrs
Net Inloading Rates				1.299	tph

Belt Scale CV-01	start	47.061.146,0		110,5%	
	finish	47.076.363,0		15.217,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	22	1.210	PMR 7 3051		
PMR 2	20	1.020	BUMA LDR		
PMR 3			DMP L220		
PMR 4	53	4.876	PMR 1 (Biru)		
PMR 5			PMR 2	15	825
PMR 6			PMR 3 (Putih)		
BUMA1	43	4.816	Other		
BUMA 2	10	1.020	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		12.942	Total Cargo from ROM		825
Delays	Mechanic				hrs
	Electric			0,83	hrs
	Operation			0,17	hrs
	Metal Detector				hrs
	Other (specify)			0,33	hrs
	Dump Hopper Empty			0,33	hrs
Total Down Time				1,67	hrs
Total Effective Operating Time				10,33	hrs
Net Inloading Rates				1.473	tph

BARGE NAMES		TCP 3003	L Mutiara		Total
Belt Scale CV-05	Start	3.136.640,0	3.144.682,0		
	Finish	3.144.682,0	3.152.705,0		
	Total belt scale	8.042,0	8.023,0		16.065,0
TOTAL DRAFT SURVEY		7.929,0	8.456,0		16.385,0
Delays	Mechanic				
	Electric		0,17		0,2
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,50	0,50		1,0
	Empty Barge	1,33	1,42	0,92	3,7
Total Down Time		0,50	0,67		1,2
Total Operating Time		4,08	4,08		8,2
Total Effective Operating Time		3,58	3,42		7,0
Net Outloading rates		2.244	2.348		2.295

BARGES NAMES		TCP 3001	Diamond O		Total
Belt Scale CV-05	Start	3.152.705,0	3.160.480,0		
	Finish	3.160.480,0	3.168.493,0		
	Total belt scale	7.775,0	8.013,0		15.788,0
TOTAL DRAFT SURVEY		7.988,0	8.125,0		16.113,0
	Mechanic				
	Electric	1,17			1,2
	Operation				
	Metal detector				
`	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,50			0,5
	Empty Barge	2,00	1,25		3,3
Total Down Time		1,67			1,7
Total Operating Time		4,83	3,92		8,8
Total Effective Operating Time		3,17	3,92		7,1
Net Outloading rates		2.455	2.046		2.229

Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
11.587	1.350	16.580	1.554	28.167	1.463
15.802	2.205	14.502	1.740	30.304	1.955
10.883	1.268	13.666	1.281	24.549	1.275
15.657	2.185	14.676	1.761	30.333	1.957

Belt Scale CV-01	start	47.076.363,0		106,5%	
	finish	47.087.950,0		11.587,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	14	770	PMR 7 3051		
PMR 2	12	612	BUMA LDR	5	30
PMR 3			DMP L220		
PMR 4	39	3.588	PMR 1 (Biru)	11	385
PMR 5			PMR 2	12	660
PMR 6			PMR 3 (Putih)		
BUMA1	35	3.920	Other		
BUMA 2	9	918	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		9.808	Total Cargo from ROM		1.075
Delays	Mechanic			2,83	hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,58	hrs
Total Down Time				3,42	hrs
Total Effective Operating Time				8,58	hrs
Net Inloading Rates				1.350	tph

Belt Scale CV-01	start	47.087.950,0		121,3%	
	finish	47.104.530,0		16.580,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	15	825	PMR 7 3051		
PMR 2	10	510	BUMA LDR	39	234
PMR 3			DMP L220		
PMR 4	61	5.612	PMR 1 (Biru)	20	700
PMR 5			PMR 2	15	825
PMR 6			PMR 3 (Putih)		
BUMA1	37	4.144	Other		
BUMA 2	8	816	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		11.907	Total Cargo from ROM		1.759
Delays	Mechanic				hrs
	Electric			0,83	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,50	hrs
Total Down Time				1,33	hrs
Total Effective Operating Time				10,67	hrs
Net Inloading Rates				1.554	tph

BARGE NAMES		Diamond. C	Diamond 3002	Diamond. A	Total
Belt Scale CV-05	Start	3.168.493,0	3.176.090,0	3.183.595,0	
	Finish	3.176.090,0	3.183.595,0	3.184.295,0	
	Total belt scale	7.597,0	7.505,0	700,0	15.802,0
TOTAL DRAFT SURVEY		7.527,0	7.430,0	700,0	15.657,0
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,33	0,50		0,8
	Empty Barge	1,50	0,92	1,33	3,8
Total Down Time		0,33	0,50		0,8
Total Operating Time		3,58	4,08	0,33	8,0
Total Effective Operating Time		3,25	3,58	0,33	7,2
Net Outloading rates		2.338	2.094	2.100	2.205

BARGES NAMES		Diamond. A	Diamond 3002		Total
Belt Scale CV-05	Start	3.183.595,0	3.190.533,0		
	Finish	3.190.533,0	3.198.097,0		
	Total belt scale	6.938,0	7.564,0		14.502,0
TOTAL DRAFT SURVEY		7.107,0	7.569,0		14.676,0
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,50			0,5
	Empty Barge		1,25	0,50	1,8
Total Down Time		0,50			0,5
Total Operating Time		3,67	5,17		8,8
Total Effective Operating Time		3,17	5,17		8,3
Net Outloading rates		2.191	1.464		1.740

Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
15.210	1.383	16.229	1.453	31.439	1.418
12.012	1.737	3.187	2.390	15.199	1.842
14.134	1.285	14.372	1.287	28.506	1.286
11.897	1.720	3.369	2.527	15.266	1.850

Belt Scale CV-01	start	47.104.530,0		107,6%	
	finish	47.119.740,0		15.210,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	22	1.210	PMR 7 3051		
PMR 2	17	867	BUMA LDR		
PMR 3			DMP L220		
PMR 4	53	4.876	PMR 1 (Biru)	15	525
PMR 5			PMR 2	16	880
PMR 6			PMR 3 (Putih)		
BUMA1	37	4.144	Other		
BUMA 2	16	1.632	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		12.729	Total Cargo from ROM		1.405
Delays	Mechanic				hrs
	Electric			0,58	hrs
	Operation			0,17	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,25	hrs
Total Down Time				1,00	hrs
Total Effective Operating Time				11,00	hrs
Net Inloading Rates				1.383	tph

Belt Scale CV-01	start	47.119.740,0		112,9%	
	finish	47.135.969,0		16.229,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	21	1.155	PMR 7 3051		
PMR 2	15	765	BUMA LDR	32	192
PMR 3			DMP L220		
PMR 4	54	4.968	PMR 1 (Biru)	22	770
PMR 5			PMR 2	18	990
PMR 6			PMR 3 (Putih)		
BUMA1	33	3.696	Other		
BUMA 2	18	1.836	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		12.420	Total Cargo from ROM		1.952
Delays	Mechanic				hrs
	Electric			0,17	hrs
	Operation			0,17	hrs
	Metal Detector			0,17	hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,33	hrs
Total Down Time				0,83	hrs
Total Effective Operating Time				11,17	hrs
Net Inloading Rates				1.453	tph

BARGE NAMES		TCP 3002	L. Mutiara		Total
Belt Scale CV-05	Start	3.198.097,0	3.205.609,0	3.210.109,0	
	Finish	3.205.609,0	3.210.109,0	3.210.109,0	
	Total belt scale	7.512,0	4.500,0		12.012,0
TOTAL DRAFT SURVEY		7.397,0	4.500,0		11.897,0
Delays	Mechanic	0,08			0,1
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,17	0,08		0,3
	Empty Barge	1,08	3,50		4,6
Total Down Time		0,25	0,08		0,3
Total Operating Time		5,17	2,08		7,3
Total Effective Operating Time		4,92	2,00		6,9
Net Outloading rates		1.528	2.250		1.737

BARGES NAMES		L. Mutiara			Total
Belt Scale CV-05	Start	3.210.109,0	3.213.296,0	3.213.296,0	
	Finish	3.213.296,0	3.213.296,0	3.213.296,0	
	Total belt scale	3.187,0			3.187,0
TOTAL DRAFT SURVEY		3.369,0			3.369,0
Delays	Mechanic				
	Electric				
	Operation	0,67			0,7
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,17			0,2
	Empty Barge		9,83		9,8
Total Down Time		0,83			0,8
Total Operating Time		2,17			2,2
Total Effective Operating Time		1,33			1,3
Net Outloading rates		2.390			2.390

Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
1.476	12.929	1.437	28.800	1.458
1.344	11.312	1.257	25.764	1.305

Belt Scale CV-01	start	47.135.969,0		109,8%	
	finish	47.151.840,0		15.871,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	22	1.210	PMR 7 3051		
PMR 2	22	1.122	BUMA LDR		
PMR 3			DMP L220		
PMR 4	50	4.600	PMR 1 (Biru)	15	525
PMR 5			PMR 2	7	385
PMR 6			PMR 3 (Putih)		
BUMA1	49	5.488	Other		
BUMA 2	11	1.122	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		13.542	Total Cargo from ROM		910
Delays	Mechanic				hrs
	Electric				hrs
	Operation			0,67	hrs
	Metal Detector			0,17	hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,42	hrs
Total Down Time				1,25	hrs
Total Effective Operating Time				10,75	hrs
Net Inloading Rates				1.476	tph

Belt Scale CV-01	start	47.151.840,0		114,3%	
	finish	47.164.769,0		12.929,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	13	715	PMR 7 3051		
PMR 2	18	918	BUMA LDR	35	210
PMR 3			DMP L220		
PMR 4	33	3.036	PMR 1 (Biru)	9	315
PMR 5			PMR 2	14	770
PMR 6			PMR 3 (Putih)		
BUMA1	35	3.920	Other		
BUMA 2	14	1.428	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		10.017	Total Cargo from ROM		1.295
Delays	Mechanic			0,25	hrs
	Electric			0,08	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)			2,08	hrs
	Dump Hopper Empty			0,58	hrs
Total Down Time				3,00	hrs
Total Effective Operating Time				9,00	hrs
Net Inloading Rates				1.437	tph

BARGE NAMES					Total
Belt Scale CV-05	Start	3.213.296,0	3.213.296,0	3.213.296,0	
	Finish	3.213.296,0	3.213.296,0	3.213.296,0	
	Total belt scale				
TOTAL DRAFT SURVEY					
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge	12,00			12,0
Total Down Time					
Total Operating Time					
Total Effective Operating Time					
Net Outloading rates					

BARGES NAMES					Total
Belt Scale CV-05	Start	**3.213.296,0**	**3.213.296,0**	**3.213.296,0**	
	Finish	**3.213.296,0**	**3.213.296,0**	**3.213.296,0**	
	Total belt scale				
TOTAL DRAFT SURVEY					
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge	**12,00**			**12,0**
Total Down Time					
Total Operating Time					
Total Effective Operating Time					
Net Outloading rates					

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01			6.604	1.258	6.604	1.258
Outloading-CV05			9.884	1.744	9.884	1.744
Inloading-TC			5.742	1.094	5.742	1.094
Outloading-DS			10.003	1.765	10.003	1.765

Belt Scale CV-01	start	**47.164.769,0**			
	finish	**47.164.769,0**			
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR		
PMR 3			DMP L220		
PMR 4			PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1			Other		
BUMA 2			Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit			Total Cargo from ROM		
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	**OP 8**		**12,00**	hrs
	Dump Hopper Empty				hrs
Total Down Time				**12,00**	hrs
Total Effective Operating Time					hrs
Net Inloading Rates					tph

Belt Scale CV-01	start	**47.164.769,0**		**115,0%**	
	finish	**47.171.373,0**		**6.604,0**	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	**2**	**110**	PMR 7 3051		
PMR 2	**3**	**153**	BUMA LDR		
PMR 3			DMP L220		
PMR 4	**2**	**184**	PMR 1 (Biru)	**13**	**455**
PMR 5			PMR 2	**8**	**440**
PMR 6			PMR 3 (Putih)		
BUMA1	**32**	**3.584**	Other		
BUMA 2	**8**	**816**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**4.847**	Total Cargo from ROM		**895**
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	**OP 8**		**6,33**	hrs
	Dump Hopper Empty			**0,42**	hrs
Total Down Time				**6,75**	hrs
Total Effective Operating Time				**5,25**	hrs
Net Inloading Rates				**1.258**	tph

BARGE NAMES					**Total**
Belt Scale CV-05	Start	**3.213.296,0**	**3.213.296,0**	**3.213.296,0**	
	Finish	**3.213.296,0**	**3.213.296,0**	**3.213.296,0**	
	Total belt scale				
TOTAL DRAFT SURVEY					
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge	**12,00**			**12,0**
Total Down Time					
Total Operating Time					
Total Effective Operating Time					
Net Outloading rates					

BARGES NAMES		TCP 3005	Diamond. H		Total
Belt Scale CV-05	Start	3.213.296,0	3.221.180,0	3.223.180,0	
	Finish	3.221.180,0	3.223.180,0	3.223.180,0	
	Total belt scale	7.884,0	2.000,0		9.884,0
TOTAL DRAFT SURVEY		8.003,0	2.000,0		10.003,0
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,17			0,2
	Empty Barge	4,50	1,58		6,1
Total Down Time		0,17			0,2
Total Operating Time		4,75	1,08		5,8
Total Effective Operating Time		4,58	1,08		5,7
Net Outloading rates		1.720	1.846		1.744

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	9.991	1.110	12.842	1.364	22.833	1.240
Outloading-CV05	17.680	2.187	13.638	1.448	31.318	1.790
Inloading-TC	8.416	935	11.535	1.225	19.951	1.083
Outloading-DS	17.910	2.216	13.862	1.472	31.772	1.816

Belt Scale CV-01	start	**47.171.373,0**		**118,7%**	
	finish	**47.181.364,0**		**9.991,0**	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1			PMR 7 3051		
PMR 2	**2**	**102**	BUMA LDR	**136**	**816**
PMR 3			DMP L220		
PMR 4	**4**	**368**	PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	**50**	**5.600**	Other		
BUMA 2	**15**	**1.530**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**7.600**	Total Cargo from ROM		**816**
Delays	Mechanic			**0,17**	hrs
	Electric			**0,17**	hrs
	Operation			**0,33**	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			**2,33**	hrs
Total Down Time				**3,00**	hrs
Total Effective Operating Time				**9,00**	hrs
Net Inloading Rates				**1.110**	tph

Belt Scale CV-01	start	47.181.364,0		111,3%	
	finish	47.194.206,0		12.842,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR	60	360
PMR 3			DMP L220		
PMR 4	14	1.288	PMR 1 (Biru)	23	805
PMR 5			PMR 2	34	1.870
PMR 6			PMR 3 (Putih)		
BUMA1	48	5.376	Other		
BUMA 2	18	1.836	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		8.500	Total Cargo from ROM		3.035
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	OP6		1,33	hrs
	Dump Hopper Empty			1,25	hrs
Total Down Time				2,58	hrs
Total Effective Operating Time				9,42	hrs
Net Inloading Rates				1.364	tph

BARGE NAMES		Diamond H	TCP 3003	TCP 3001	Total
Belt Scale CV-05	Start	3.223.180,0	3.229.030,0	3.236.560,0	
	Finish	3.229.030,0	3.236.560,0	3.240.860,0	
	Total belt scale	5.850,0	7.530,0	4.300,0	17.680,0
TOTAL DRAFT SURVEY		5.877,0	7.733,0	4.300,0	17.910,0
Delays	Mechanic				
	Electric				
	Operation	0,92			0,9
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,17	0,50		0,7
	Empty Barge		0,83	1,42	2,3
Total Down Time		1,08	0,50		1,6
Total Operating Time		3,92	3,50	2,25	9,7
Total Effective Operating Time		2,83	3,00	2,25	8,1
Net Outloading rates		2.065	2.510	1.911	2.187

BARGES NAMES		TCP 3001	Diamond. A	TCP 3002	Total
Belt Scale CV-05	Start	3.223.180,0	3.226.294,0	3.233.818,0	
	Finish	3.226.294,0	3.233.818,0	3.236.818,0	
	Total belt scale	3.114,0	7.524,0	3.000,0	13.638,0
TOTAL DRAFT SURVEY		3.161,0	7.701,0	3.000,0	13.862,0
Delays	Mechanic				
	Electric				
	Operation	0,50			0,5
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,25			0,3
	Empty Barge		0,67	1,00	1,7
Total Down Time		0,75			0,8
Total Operating Time		3,17	5,25	1,75	10,2
Total Effective Operating Time		2,42	5,25	1,75	9,4
Net Outloading rates		1.289	1.433	1.714	1.448

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	11.303	1.384	11.351	1.310	22.654	1.346
Outloading-CV05	12.606	1.592	7.538	1.508	20.144	1.560
Inloading-TC	9.908	1.213	10.003	1.154	19.911	1.183
Outloading-DS	13.029	1.646	7.672	1.534	20.701	1.603

Belt Scale CV-01	start	47.194.206,0		114,1%	
	finish	47.205.509,0		11.303,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	7	385	PMR 7 3051		
PMR 2	6	306	BUMA LDR	110	660
PMR 3			DMP L220		
PMR 4			PMR 1 (Biru)	8	280
PMR 5			PMR 2	19	1.045
PMR 6			PMR 3 (Putih)		
BUMA1	50	5.600	Other		
BUMA 2	16	1.632	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		7.923	Total Cargo from ROM		1.985
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			3,83	hrs
Total Down Time				3,83	hrs
Total Effective Operating Time				8,17	hrs
Net Inloading Rates				1.384	tph

Belt Scale CV-01	start	47.205.509,0		113,5%	
	finish	47.216.860,0		11.351,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR	74	444
PMR 3			DMP L220		
PMR 4	8	736	PMR 1 (Biru)	27	945
PMR 5			PMR 2	26	1.430
PMR 6			PMR 3 (Putih)		
BUMA1	43	4.816	Other		
BUMA 2	16	1.632	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		7.184	Total Cargo from ROM		2.819
Delays	Mechanic			1,58	hrs
	Electric			0,33	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			1,42	hrs
Total Down Time				3,33	hrs
Total Effective Operating Time				8,67	hrs
Net Inloading Rates				1.310	tph

Belt Scale CV-01	start	**47.205.509,0**		**113,5%**	
	finish	**47.216.860,0**		**11.351,0**	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR	**74**	**444**
PMR 3			DMP L220		
PMR 4	**8**	**736**	PMR 1 (Biru)	**27**	**945**
PMR 5			PMR 2	**26**	**1.430**
PMR 6			PMR 3 (Putih)		
BUMA1	**43**	**4.816**	Other		
BUMA 2	**16**	**1.632**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**7.184**	Total Cargo from ROM		**2.819**
Delays	Mechanic			**1,58**	hrs
	Electric			**0,33**	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			**1,42**	hrs
Total Down Time				**3,33**	hrs
Total Effective Operating Time				**8,67**	hrs
Net Inloading Rates				**1.310**	tph

BARGE NAMES		**TCP 3002**	**Diamond H**		**Total**
Belt Scale CV-05	Start	**3.236.818,0**	**3.241.414,0**	**3.249.424,0**	
	Finish	**3.241.414,0**	**3.249.424,0**	**3.249.424,0**	
	Total belt scale	**4.596,0**	**8.010,0**		**12.606,0**
TOTAL DRAFT SURVEY		**4.741,0**	**8.288,0**		**13.029,0**
Delays	Mechanic				
	Electric				
	Operation	**0,92**			**0,9**
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	**0,17**	**0,50**		**0,7**
	Empty Barge		**1,17**	**1,25**	**2,4**
Total Down Time		**1,08**	**0,50**		**1,6**
Total Operating Time		**4,08**	**5,42**		**9,5**
Total Effective Operating Time		**3,00**	**4,92**		**7,9**
Net Outloading rates		**1.532**	**1.629**		**1.592**

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	13.493	1.199	5.072	1.323	18.565	1.231
Outloading-CV05	7.275	1.587			7.275	1.587
Inloading-TC	11.683	1.038	4.043	1.055	15.726	1.043
Outloading-DS	7.414	1.618			7.414	1.618

	start	47.216.860,0		115,5%	
	finish	47.230.353,0		13.493,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR	7	42
PMR 3			DMP L220		
PMR 4			PMR 1 (Biru)	47	1.645
PMR 5			PMR 2	46	2.530
PMR 6			PMR 3 (Putih)		
BUMA1	53	5.936	Other		
BUMA 2	15	1.530	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		7.466	Total Cargo from ROM		4.217
Delays	Mechanic				hrs
	Electric				hrs
	Operation			0,17	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,58	hrs
Total Down Time				0,75	hrs
Total Effective Operating Time				11,25	hrs
Net Inloading Rates				1.199	tph

Belt Scale CV-01	start	47.230.353,0		125,5%	
	finish	47.235.425,0		5.072,0	
PIT			ROM PAD		TONNES
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR	26	156
PMR 3			DMP L220	22	165
PMR 4			PMR 1 (Biru)	2	70
PMR 5			PMR 2	4	220
PMR 6			PMR 3 (Putih)		
BUMA1	27	3.024	Other		
BUMA 2	4	408	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		3.432	Total Cargo from ROM		611
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector			0,17	hrs
	Other (specify)			7,17	hrs
	Dump Hopper Empty			0,83	hrs
Total Down Time				8,17	hrs
Total Effective Operating Time				3,83	hrs
Net Inloading Rates				1.323	tph

BARGE NAMES		Diamond O			Total
Belt Scale CV-05	Start	3.256.962,0	3.264.237,0	3.264.237,0	
	Finish	3.264.237,0	3.264.237,0	3.264.237,0	
	Total belt scale	7.275,0			7.275,0
TOTAL DRAFT SURVEY		7.414,0			7.414,0
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,67			0,7
	Empty Barge	2,00	4,75		6,8
Total Down Time		0,67			0,7
Total Operating Time		5,25			5,3
Total Effective Operating Time		4,58			4,6
Net Outloading rates		1.587			1.587

BARGES NAMES				
Belt Scale CV-05	Start	**3.264.237,0**	**3.264.237,0**	**3.264.237,0**
	Finish	**3.264.237,0**	**3.264.237,0**	**3.264.237,0**
	Total belt scale			
TOTAL DRAFT SURVEY				
Delays	Mechanic			
	Electric			
	Operation			
	Metal detector			
	Weather			
	Waiting Cargo			
	Other			
	Barge Shifting			
	Empty Barge	**12,00**		
Total Down Time				
Total Operating Time				
Total Effective Operating Time				
Net Outloading rates				

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01						
Outloading-CV05	**15.463**	**2.263**	**13.684**	**1.866**	**29.147**	**2.057**
Inloading-TC						
Outloading-DS	**15.684**	**2.295**	**13.646**	**1.861**	**29.330**	**2.070**

Belt Scale CV-01	start	**47.235.425,0**			
	finish	**47.235.425,0**			
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR		
PMR 3			DMP L220		
PMR 4			PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1			Other		
BUMA 2			Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit			Total Cargo from ROM		
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	**SM 1**		**12,00**	hrs
	Dump Hopper Empty				hrs
Total Down Time				**12,00**	hrs
Total Effective Operating Time					hrs
Net Inloading Rates					tph

Belt Scale CV-01	start	**47.235.425,0**			
	finish				
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR		
PMR 3			DMP L220		
PMR 4			PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1			Other		
BUMA 2			Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit			Total Cargo from ROM		
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	**SM 1**		**12,00**	hrs
	Dump Hopper Empty				hrs
Total Down Time				**12,00**	hrs
Total Effective Operating Time					hrs
Net Inloading Rates					tph

BARGE NAMES		**TCP 3005**	**RMN 354**		**Total**
Belt Scale CV-05	Start	**3.264.237,0**	**3.271.987,0**	**3.279.700,0**	
	Finish	**3.271.987,0**	**3.279.700,0**	**3.279.700,0**	
	Total belt scale	**7.750,0**	**7.713,0**		**15.463,0**
TOTAL DRAFT SURVEY		**7.997,0**	**7.687,0**		**15.684,0**
Delays	Mechanic	**0,42**			**0,4**
	Electric	**0,17**			**0,2**
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	**0,33**	**0,50**		**0,8**
	Empty Barge	**2,08**	**1,75**		**3,8**
Total Down Time		**0,92**	**0,50**		**1,4**
Total Operating Time		**4,00**	**4,25**		**8,3**
Total Effective Operating Time		**3,08**	**3,75**		**6,8**
Net Outloading rates		**2.514**	**2.057**		**2.263**

BARGES NAMES		Diamond 3003	TCP 3003		Total
Belt Scale CV-05	Start	3.279.700,0	3.287.184,0	3.293.384,0	
	Finish	3.287.184,0	3.293.384,0	3.293.384,0	
	Total belt scale	7.484,0	6.200,0		13.684,0
TOTAL DRAFT SURVEY		7.446,0	6.200,0		13.646,0
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,50	0,33		0,8
	Empty Barge	2,00	1,42		3,4
Total Down Time		0,50	0,33		0,8
Total Operating Time		4,08	4,08		8,2
Total Effective Operating Time		3,58	3,75		7,3
Net Outloading rates		2.089	1.653		1.866

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	7.835	1.147	11.195	1.256	19.030	1.208
Outloading-CV05	11.724	1.804	13.148	1.948	24.872	1.877
Inloading-TC	7.585	1.110	9.932	1.114	17.517	1.112
Outloading-DS	11.725	1.804	13.752	2.037	25.477	1.923

Belt Scale CV-01	start	47.235.425,0		103,3%	
	finish	47.243.260,0		7.835,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR	84	504
PMR 3			DMP L220		
PMR 4			PMR 1 (Biru)	22	770
PMR 5			PMR 2	39	2.145
PMR 6			PMR 3 (Putih)		
BUMA1	29	3.248	Other		
BUMA 2	9	918	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		4.166	Total Cargo from ROM		3.419
Delays	Mechanic				hrs
	Electric			0,58	hrs
	Operation			0,17	hrs
	Metal Detector			0,17	hrs
	Other (specify)	SM 1		3,50	hrs
	Dump Hopper Empty			0,75	hrs
Total Down Time				5,17	hrs
Total Effective Operating Time				6,83	hrs
Net Inloading Rates				1.147	tph

Belt Scale CV-01	start	47.243.260,0		112,7%	
	finish	47.254.455,0		11.195,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR	36	216
PMR 3			DMP L220		
PMR 4			PMR 1 (Biru)	41	1.435
PMR 5			PMR 2	15	825
PMR 6			PMR 3 (Putih)		
BUMA1	52	5.824	Other		
BUMA 2	16	1.632	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		7.456	Total Cargo from ROM		2.476
Delays	Mechanic				hrs
	Electric			1,17	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)			1,25	hrs
	Dump Hopper Empty			0,67	hrs
Total Down Time				3,08	hrs
Total Effective Operating Time				8,92	hrs
Net Inloading Rates				1.256	tph

BARGE NAMES		TCP 3003	Diamond H	L Mutiara	Total
Belt Scale CV-05	Start	3.293.384,0	3.294.937,0	3.302.608,0	
	Finish	3.294.937,0	3.302.608,0	3.305.108,0	
	Total belt scale	1.553,0	7.671,0	2.500,0	11.724,0
TOTAL DRAFT SURVEY		1.524,0	7.701,0	2.500,0	11.725,0
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector			0,17	0,2
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,17	0,33	0,17	0,7
	Empty Barge		1,33	1,33	2,7
Total Down Time		0,17	0,33	0,33	0,8
Total Operating Time		0,83	4,83	1,67	7,3
Total Effective Operating Time		0,67	4,50	1,33	6,5
Net Outloading rates		2.330	1.705	1.875	1.804

BARGES NAMES		L Mutiara	Diamond 3002	Diamond C	Total
Belt Scale CV-05	Start	3.305.108,0	3.310.133,0	3.317.356,0	
	Finish	3.310.133,0	3.317.356,0	3.318.256,0	
	Total belt scale	5.025,0	7.223,0	900,0	13.148,0
TOTAL DRAFT SURVEY		5.309,0	7.543,0	900,0	13.752,0
Delays	Mechanic				
	Electric		0,83		0,8
	Operation	0,83			0,8
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,58	0,17		0,8
	Empty Barge		1,00	1,67	2,7
Total Down Time		1,42	1,00		2,4
Total Operating Time		3,83	4,92	0,42	9,2
Total Effective Operating Time		2,42	3,92	0,42	6,8
Net Outloading rates		2.079	1.844	2.160	1.948

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	12.882	1.431	14.281	1.490	27.163	1.462
Outloading-CV05	12.452	1.509	10.692	1.758	23.144	1.615
Inloading-TC	11.151	1.239	11.794	1.231	22.945	1.235
Outloading-DS	12.568	1.523	10.746	1.766	23.314	1.627

Belt Scale CV-01	start	47.254.455,0		115,5%	
	finish	47.267.337,0		12.882,0	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1			PMR 7 3051		
PMR 2	**1**	**51**	BUMA LDR		
PMR 3			DMP L220		
PMR 4	**16**	**1.472**	PMR 1 (Biru)	**40**	**1.400**
PMR 5			PMR 2	**22**	**1.210**
PMR 6			PMR 3 (Putih)		
BUMA1	**49**	**5.488**	Other		
BUMA 2	**15**	**1.530**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**8.541**	Total Cargo from ROM		**2.610**
Delays	Mechanic				hrs
	Electric			**0,75**	hrs
	Operation			**0,17**	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			**2,08**	hrs
Total Down Time				**3,00**	hrs
Total Effective Operating Time				**9,00**	hrs
Net Inloading Rates				**1.431**	tph

Belt Scale CV-01	start	47.267.337,0		121,1%	
	finish	47.281.618,0		14.281,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	9	495	PMR 7 3051		
PMR 2	7	357	BUMA LDR	17	102
PMR 3			DMP L220		
PMR 4	44	4.048	PMR 1 (Biru)	34	1.190
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	40	4.480	Other		
BUMA 2	11	1.122	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		10.502	Total Cargo from ROM		1.292
Delays	Mechanic				hrs
	Electric			2,08	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,33	hrs
Total Down Time				2,42	hrs
Total Effective Operating Time				9,58	hrs
Net Inloading Rates				1.490	tph

BARGE NAMES		Diamond. C	TCP 3001		Total
Belt Scale CV-05	Start	3.317.356,0	3.323.808,0	3.329.808,0	
	Finish	3.323.808,0	3.329.808,0	3.329.808,0	
	Total belt scale	6.452,0	6.000,0		12.452,0
TOTAL DRAFT SURVEY		6.568,0	6.000,0		12.568,0
Delays	Mechanic				
	Electric	0,83			0,8
	Operation	0,50			0,5
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,58	0,25		0,8
	Empty Barge		1,50		1,5
Total Down Time		1,92	0,25		2,2
Total Operating Time		6,92	3,50		10,4
Total Effective Operating Time		5,00	3,25		8,3
Net Outloading rates		1.290	1.846		1.509

BARGES NAMES		TCP 3001	Diamond 3002	TCP 3002	Total
Belt Scale CV-05	Start	3.329.808,0	3.331.638,0	3.339.000,0	
	Finish	3.331.638,0	3.339.000,0	3.340.500,0	
	Total belt scale	1.830,0	7.362,0	1.500,0	10.692,0
TOTAL DRAFT SURVEY		1.960,0	7.286,0	1.500,0	10.746,0
Delays	Mechanic				
	Electric	3,08			3,1
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,17	0,33		0,5
	Empty Barge		1,08	1,08	2,2
Total Down Time		3,25	0,33		3,6
Total Operating Time		4,25	4,50	0,92	9,7
Total Effective Operating Time		1,00	4,17	0,92	6,1
Net Outloading rates		1.830	1.767	1.636	1.758

Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
12.607	1.271	15.375	1.299	27.982	1.287
13.541	1.889	15.411	2.499	28.952	2.171
11.135	1.123	13.729	1.160	24.864	1.143
13.675	1.908	15.161	2.459	28.836	2.163

Belt Scale CV-01	start	47.281.618,0		113,2%	
	finish	47.294.225,0		12.607,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	16	880	PMR 7 3051		
PMR 2	11	561	BUMA LDR		
PMR 3			DMP L220		
PMR 4	38	3.496	PMR 1 (Biru)	24	840
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	36	4.032	Other		
BUMA 2	13	1.326	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		10.295	Total Cargo from ROM		840
Delays	Mechanic				hrs
	Electric			1,92	hrs
	Operation			0,17	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty				hrs
Total Down Time				2,08	hrs
Total Effective Operating Time				9,92	hrs
Net Inloading Rates				1.271	tph

Belt Scale CV-01	start	**47.294.225,0**		**112,0%**	
	finish	**47.309.600,0**		**15.375,0**	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	**18**	**990**	PMR 7 3051		
PMR 2	**21**	**1.071**	BUMA LDR	**10**	**60**
PMR 3			DMP L220		
PMR 4	**51**	**4.692**	PMR 1 (Biru)	**16**	**560**
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	**44**	**4.928**	Other		
BUMA 2	**14**	**1.428**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**13.109**	Total Cargo from ROM		**620**
Delays	Mechanic				hrs
	Electric			**0,17**	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty				hrs
Total Down Time				**0,17**	hrs
Total Effective Operating Time				**11,83**	hrs
Net Inloading Rates				**1.299**	tph

BARGE NAMES		**TCP 3002**	**Diamond. A**		
Belt Scale CV-05	Start	**3.340.500,0**	**3.346.516,0**	**3.354.041,0**	**Total**
	Finish	**3.346.516,0**	**3.354.041,0**	**3.354.041,0**	
	Total belt scale	**6.016,0**	**7.525,0**		**13.541,0**
TOTAL DRAFT SURVEY		**5.917,0**	**7.758,0**		**13.675,0**
Delays	Mechanic				
	Electric	**2,17**	**0,25**		**2,4**
	Operation	**0,50**			**0,5**
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	**0,33**	**0,42**		**0,8**
	Empty Barge		**0,83**	**0,17**	**1,0**
Total Down Time		**3,00**	**0,67**		**3,7**
Total Operating Time		**6,00**	**4,83**		**10,8**
Total Effective Operating Time		**3,00**	**4,17**		**7,2**
Net Outloading rates		**2.005**	**1.806**		**1.889**

BARGES NAMES		Diamond H	TCP 3003		Total
Belt Scale CV-05	Start	3.354.041,0	3.361.657,0	3.369.452,0	
	Finish	3.361.657,0	3.369.452,0	3.369.452,0	
	Total belt scale	7.616,0	7.795,0		15.411,0
TOTAL DRAFT SURVEY		7.412,0	7.749,0		15.161,0
Delays	Mechanic				
	Electric	0,42			0,4
	Operation				
	Metal detector	0,17			0,2
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,50	0,50		1,0
	Empty Barge	1,17	1,33	1,58	4,1
Total Down Time		1,08	0,50		1,6
Total Operating Time		3,92	3,83		7,8
Total Effective Operating Time		2,83	3,33		6,2
Net Outloading rates		2.688	2.339		2.499

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	14.393	1.289	17.330	1.575	31.723	1.431
Outloading-CV05	14.770	1.790	13.410	1.768	28.180	1.780
Inloading-TC	12.751	1.142	14.902	1.355	27.653	1.248
Outloading-DS	15.087	1.829	13.622	1.796	28.709	1.813

Belt Scale CV-01	start	**47.334.037,0**		**112,9%**	
	finish	**47.348.430,0**		**14.393,0**	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	**15**	**825**	PMR 7 3051		
PMR 2	**26**	**1.326**	BUMA LDR		
PMR 3			DMP L220		
PMR 4	**52**	**4.784**	PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	**41**	**4.592**	Other		
BUMA 2	**12**	**1.224**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**12.751**	Total Cargo from ROM		
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			**0,83**	hrs
Total Down Time				**0,83**	hrs
Total Effective Operating Time				**11,17**	hrs
Net Inloading Rates				**1.289**	tph

Belt Scale CV-01	start	47.348.430,0		116,3%	
	finish	47.365.760,0		17.330,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	17	935	PMR 7 3051		
PMR 2	19	969	BUMA LDR	39	234
PMR 3			DMP L220		
PMR 4	66	6.072	PMR 1 (Biru)		
PMR 5			PMR 2	20	1.100
PMR 6			PMR 3 (Putih)		
BUMA1	39	4.368	Other		
BUMA 2	12	1.224	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		13.568	Total Cargo from ROM		1.334
Delays	Mechanic			0,17	hrs
	Electric			0,50	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,33	hrs
Total Down Time				1,00	hrs
Total Effective Operating Time				11,00	hrs
Net Inloading Rates				1.575	tph

BARGE NAMES		TCP 3002	Diamond C	TCP 3003	Total
Belt Scale CV-05	Start	3.377.146,0	3.377.973,0	3.385.416,0	
	Finish	3.377.973,0	3.385.416,0	3.391.916,0	
	Total belt scale	827,0	7.443,0	6.500,0	14.770,0
TOTAL DRAFT SURVEY		750,0	7.837,0	6.500,0	15.087,0
Delays	Mechanic				
	Electric				
	Operation	0,83			0,8
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting		0,50	0,50	1,0
	Empty Barge		0,83	1,08	1,9
Total Down Time		0,83	0,50	0,50	1,8
Total Operating Time		2,00	4,67	3,42	10,1
Total Effective Operating Time		1,17	4,17	2,92	8,3
Net Outloading rates		709	1.786	2.229	1.790

BARGES NAMES		TCP 3003	Diamond 3003	TCP 3002	Total
Belt Scale CV-05	Start	3.385.416,0	3.386.768,0	3.394.326,0	
	Finish	3.386.768,0	3.394.326,0	3.398.826,0	
	Total belt scale	1.352,0	7.558,0	4.500,0	13.410,0
TOTAL DRAFT SURVEY		1.510,0	7.612,0	4.500,0	13.622,0
Delays	Mechanic				
	Electric				
	Operation	0,50			0,5
	Metal detector		0,25		0,3
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting		0,50	0,17	0,7
	Empty Barge		1,58	1,42	3,0
Total Down Time		0,50	0,75	0,17	1,4
Total Operating Time		1,50	5,00	2,50	9,0
Total Effective Operating Time		1,00	4,25	2,33	7,6
Net Outloading rates		1.352	1.778	1.929	1.768

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	17.122	1.511	16.258	1.467	33.380	1.489
Outloading-CV05	14.362	1.936	11.745	1.905	26.107	1.922
Inloading-TC	14.219	1.255	14.397	1.299	28.616	1.277
Outloading-DS	14.464	1.950	11.937	1.936	26.401	1.944

Belt Scale CV-01	start	47.365.760,0		120,4%	
	finish	47.382.882,0		17.122,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	17	935	PMR 7 3051		
PMR 2	24	1.224	BUMA LDR	26	156
PMR 3			DMP L220		
PMR 4	55	5.060	PMR 1 (Biru)		
PMR 5			PMR 2	20	1.100
PMR 6			PMR 3 (Putih)		
BUMA1	44	4.928	Other		
BUMA 2	8	816	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		12.963	Total Cargo from ROM		1.256
Delays	Mechanic				hrs
	Electric			0,25	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,42	hrs
Total Down Time				0,67	hrs
Total Effective Operating Time				11,33	hrs
Net Inloading Rates				1.511	tph

Belt Scale CV-01	start	47.382.882,0		112,9%	
	finish	47.399.140,0		16.258,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	22	1.210	PMR 7 3051		
PMR 2	19	969	BUMA LDR		
PMR 3			DMP L220		
PMR 4	65	5.980	PMR 1 (Biru)		
PMR 5			PMR 2	16	880
PMR 6			PMR 3 (Putih)		
BUMA1	36	4.032	Other		
BUMA 2	13	1.326	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		13.517	Total Cargo from ROM		880
Delays	Mechanic				hrs
	Electric			0,67	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	OP 10		0,25	hrs
	Dump Hopper Empty				hrs
Total Down Time				0,92	hrs
Total Effective Operating Time				11,08	hrs
Net Inloading Rates				1.467	tph

BARGE NAMES		TCP 3002	L Mutiara	TCP 3003	Total
Belt Scale CV-05	Start	3.398.826,0	3.401.883,0	3.409.488,0	
	Finish	3.401.883,0	3.409.488,0	3.413.188,0	
	Total belt scale	3.057,0	7.605,0	3.700,0	14.362,0
TOTAL DRAFT SURVEY		3.170,0	7.594,0	3.700,0	14.464,0
Delays	Mechanic				
	Electric	0,42			0,4
	Operation	0,83			0,8
	Metal detector			0,17	0,2
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,17	0,33	0,17	0,7
	Empty Barge		1,42	0,92	2,3
Total Down Time		1,42	0,33	0,33	2,1
Total Operating Time		3,42	4,17	1,92	9,5
Total Effective Operating Time		2,00	3,83	1,58	7,4
Net Outloading rates		1.529	1.984	2.337	1.936

BARGES NAMES		TCP 3003	Diamond 3003		Total
Belt Scale CV-05	Start	3.409.488,0	3.413.484,0	3.421.233,0	
	Finish	3.413.484,0	3.421.233,0	3.421.233,0	
	Total belt scale	3.996,0	7.749,0		11.745,0
TOTAL DRAFT SURVEY		3.986,0	7.951,0		11.937,0
Delays	Mechanic				
	Electric				
	Operation	2,58			2,6
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge		0,83	2,33	3,2
Total Down Time		2,58			2,6
Total Operating Time		5,00	3,75		8,8
Total Effective Operating Time		2,42	3,75		6,2
Net Outloading rates		1.654	2.066		1.905

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	16.103	1.475	17.252	1.545	33.355	1.510
Outloading-CV05	7.696	1.885			7.696	1.885
Inloading-TC	14.243	1.305	15.854	1.420	30.097	1.363
Outloading-DS	7.705	1.887			7.705	1.887

Belt Scale CV-01	start	47.399.140,0		113,1%	
	finish	47.415.243,0		16.103,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	18	990	PMR 7 3051		
PMR 2	19	969	BUMA LDR		
PMR 3			DMP L220	8	60
PMR 4	53	4.876	PMR 1 (Biru)		
PMR 5			PMR 2	16	880
PMR 6			PMR 3 (Putih)		
BUMA1	45	5.040	Other		
BUMA 2	14	1.428	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		13.303	Total Cargo from ROM		940
Delays	Mechanic				hrs
	Electric			0,25	hrs
	Operation			0,67	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,17	hrs
Total Down Time				1,08	hrs
Total Effective Operating Time				10,92	hrs
Net Inloading Rates				1.475	tph

Belt Scale CV-01	start	**47.415.243,0**		**108,8%**	
	finish	**47.432.495,0**		**17.252,0**	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	**19**	**1.045**	PMR 7 3051		
PMR 2	**19**	**969**	BUMA LDR	**27**	**162**
PMR 3			DMP L220		
PMR 4	**63**	**5.796**	PMR 1 (Biru)		
PMR 5			PMR 2	**22**	**1.210**
PMR 6			PMR 3 (Putih)		
BUMA1	**45**	**5.040**	Other		
BUMA 2	**16**	**1.632**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**14.482**	Total Cargo from ROM		**1.372**
Delays	Mechanic				hrs
	Electric			**0,17**	hrs
	Operation			**0,17**	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			**0,50**	hrs
Total Down Time				**0,83**	hrs
Total Effective Operating Time				**11,17**	hrs
Net Inloading Rates				**1.545**	tph

BARGE NAMES		**Diamond C**			**Total**
Belt Scale CV-05	Start	**3.421.233,0**	**3.428.929,0**		
	Finish	**3.428.929,0**			
	Total belt scale	**7.696,0**			**7.696,0**
TOTAL DRAFT SURVEY		**7.705,0**			**7.705,0**
Delays	Mechanic				
	Electric	**0,42**			**0,4**
	Operation				
	Metal detector	**0,17**			**0,2**
	Weather				
	Waiting Cargo				
	Other	**5,33**			**5,3**
	Barge Shifting	**0,33**			**0,3**
	Empty Barge	**1,50**	**0,50**		**2,0**
Total Down Time		**6,25**			**6,3**
Total Operating Time		**10,33**			**10,3**
Total Effective Operating Time		**4,08**			**4,1**
Net Outloading rates		**1.885**			**1.885**

BARGES NAMES					Total
Belt Scale CV-05	Start				
	Finish				
	Total belt scale				
TOTAL DRAFT SURVEY					
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge	**12,00**			**12,0**
Total Down Time					
Total Operating Time					
Total Effective Operating Time					
Net Outloading rates					

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	14.608	1.338	8.793	1.486	23.401	1.390
Outloading-CV05	11.584	2.172	11.556	2.201	23.140	2.186
Inloading-TC	13.035	1.194	7.812	1.320	20.847	1.238
Outloading-DS	11.760	2.205	11.608	2.211	23.368	2.208

Belt Scale CV-01	start	47.432.495,0		112,1%	
	finish	47.447.103,0		14.608,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	13	715	PMR 7 3051		
PMR 2	18	918	BUMA LDR	11	66
PMR 3			DMP L220		
PMR 4	43	3.956	PMR 1 (Biru)		
PMR 5			PMR 2	34	1.870
PMR 6			PMR 3 (Putih)		
BUMA1	41	4.592	Other		
BUMA 2	9	918	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		11.099	Total Cargo from ROM		1.936
Delays	Mechanic				hrs
	Electric			0,50	hrs
	Operation			0,25	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,33	hrs
Total Down Time				1,08	hrs
Total Effective Operating Time				10,92	hrs
Net Inloading Rates				1.338	tph

Belt Scale CV-01	start	**47.447.103,0**		**112,6%**	
	finish	**47.455.896,0**		**8.793,0**	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	**12**	**660**	PMR 7 3051		
PMR 2	**15**	**765**	BUMA LDR		
PMR 3			DMP L220		
PMR 4	**33**	**3.036**	PMR 1 (Biru)		
PMR 5			PMR 2	**5**	**275**
PMR 6			PMR 3 (Putih)		
BUMA1	**22**	**2.464**	Other		
BUMA 2	**6**	**612**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**7.537**	Total Cargo from ROM		**275**
Delays	Mechanic				hrs
	Electric			**0,42**	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	**OP8**		**5,33**	hrs
	Dump Hopper Empty			**0,33**	hrs
Total Down Time				**6,08**	hrs
Total Effective Operating Time				**5,92**	hrs
Net Inloading Rates				**1.486**	tph

BARGE NAMES		**L Mutiara**	**Diamond 3003**		**Total**
Belt Scale CV-05	Start	**3.428.929,0**	**3.436.713,0**	**3.440.513,0**	
	Finish	**3.436.713,0**	**3.440.513,0**	**3.440.513,0**	
	Total belt scale	**7.784,0**	**3.800,0**		**11.584,0**
TOTAL DRAFT SURVEY		**7.960,0**	**3.800,0**		**11.760,0**
Delays	Mechanic				
	Electric		**0,42**		**0,4**
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	**0,50**	**0,17**		**0,7**
	Empty Barge	**2,33**	**3,00**		**5,3**
Total Down Time		**0,50**	**0,58**		**1,1**
Total Operating Time		**4,58**	**1,83**		**6,4**
Total Effective Operating Time		**4,08**	**1,25**		**5,3**
Net Outloading rates		**1.906**	**3.040**		**2.172**

BARGES NAMES		Diamond 3003	TCP 3003		Total
Belt Scale CV-05	Start	3.440.513,0	3.444.238,0	3.452.069,0	
	Finish	3.444.238,0	3.452.069,0	3.452.069,0	
	Total belt scale	3.725,0	7.831,0		11.556,0
TOTAL DRAFT SURVEY		3.820,0	7.788,0		11.608,0
Delays	Mechanic				
	Electric		0,33		0,3
	Operation	0,83			0,8
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,33			0,3
	Empty Barge		5,25		5,3
Total Down Time		1,17	0,33		1,5
Total Operating Time		2,83	3,58		6,4
Total Effective Operating Time		1,67	3,58		5,3
Net Outloading rates		2.235	2.185		2.201

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	9.682	1.570	16.280	1.550	25.962	1.558
Outloading-CV05	11.310	1.996	18.127	2.500	29.437	2.279
Inloading-TC	8.819	1.430	15.285	1.456	24.104	1.446
Outloading-DS	11.354	2.004	18.552	2.559	29.906	2.315

Belt Scale CV-01	start	47.455.896,0		109,8%	
	finish	47.465.578,0		9.682,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	8	440	PMR 7 3051		
PMR 2	8	408	BUMA LDR	6	36
PMR 3			DMP L220	14	105
PMR 4	23	2.116	PMR 1 (Biru)	1	35
PMR 5			PMR 2	19	1.045
PMR 6			PMR 3 (Putih)		
BUMA1	35	3.920	Other		
BUMA 2	7	714	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		7.598	Total Cargo from ROM		1.221
Delays	Mechanic			4,75	hrs
	Electric				hrs
	Operation			0,17	hrs
	Metal Detector				hrs
	Other (specify)	HE		0,42	hrs
	Dump Hopper Empty			0,50	hrs
Total Down Time				5,83	hrs
Total Effective Operating Time				6,17	hrs
Net Inloading Rates				1.570	tph

Belt Scale CV-01	start	47.465.578,0		106,5%	
	finish	47.481.858,0		16.280,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	24	1.320	PMR 7 3051		
PMR 2	16	816	BUMA LDR	32	192
PMR 3			DMP L220		
PMR 4	48	4.416	PMR 1 (Biru)		
PMR 5			PMR 2	29	1.595
PMR 6			PMR 3 (Putih)		
BUMA1	52	5.824	Other		
BUMA 2	11	1.122	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		13.498	Total Cargo from ROM		1.787
Delays	Mechanic				hrs
	Electric			0,42	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	HE		0,33	hrs
	Dump Hopper Empty			0,75	hrs
Total Down Time				1,50	hrs
Total Effective Operating Time				10,50	hrs
Net Inloading Rates				1.550	tph

BARGE NAMES		Diamond O	Diamond 3003		Total
Belt Scale CV-05	Start	3.452.069,0	3.459.579,0	3.463.379,0	
	Finish	3.459.579,0	3.463.379,0	3.463.379,0	
	Total belt scale	7.510,0	3.800,0		11.310,0
TOTAL DRAFT SURVEY		7.554,0	3.800,0		11.354,0
Delays	Mechanic				
	Electric		0,42		0,4
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,50			0,5
	Empty Barge	4,00	1,42		5,4
Total Down Time		0,50	0,42		0,9
Total Operating Time		4,00	2,58		6,6
Total Effective Operating Time		3,50	2,17		5,7
Net Outloading rates		2.146	1.754		1.996

BARGES NAMES		Diamond 3003	L Mutiara	TCP 3003	Total
Belt Scale CV-05	Start	3.463.379,0	3.467.053,0	3.475.206,0	
	Finish	3.467.053,0	3.475.206,0	3.481.506,0	
	Total belt scale	3.674,0	8.153,0	6.300,0	18.127,0
TOTAL DRAFT SURVEY		3.932,0	8.320,0	6.300,0	18.552,0
Delays	Mechanic				
	Electric				
	Operation	1,08			1,1
	Metal detector	0,25			0,3
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,17	0,50	0,17	0,8
	Empty Barge		1,42	1,17	2,6
Total Down Time		1,50	0,50	0,17	2,2
Total Operating Time		3,00	3,50	2,92	9,4
Total Effective Operating Time		1,50	3,00	2,75	7,3
Net Outloading rates		2.449	2.718	2.291	2.500

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	16.956	1.553	12.646	1.141	29.602	1.346
Outloading-CV05	13.499	1.975	11.629	2.365	25.128	2.139
Inloading-TC	14.673	1.344	12.427	1.121	27.100	1.232
Outloading-DS	13.434	1.966	11.679	2.375	25.113	2.137

Belt Scale CV-01	start	47.481.858,0		115,6%	
	finish	47.498.814,0		16.956,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	13	715	PMR 7 3051		
PMR 2	34	1.734	BUMA LDR	6	36
PMR 3			DMP L220		
PMR 4	57	5.244	PMR 1 (Biru)		
PMR 5			PMR 2	22	1.210
PMR 6			PMR 3 (Putih)		
BUMA1	43	4.816	Other		
BUMA 2	9	918	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		13.427	Total Cargo from ROM		1.246
Delays	Mechanic				hrs
	Electric				hrs
	Operation			0,50	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,58	hrs
Total Down Time				1,08	hrs
Total Effective Operating Time				10,92	hrs
Net Inloading Rates				1.553	tph

Belt Scale CV-01	start	47.498.814,0		101,8%	
	finish	47.511.460,0		12.646,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	12	660	PMR 7 3051		
PMR 2	25	1.275	BUMA LDR	24	144
PMR 3			DMP L220		
PMR 4	49	4.508	PMR 1 (Biru)		
PMR 5			PMR 2	6	330
PMR 6			PMR 3 (Putih)		
BUMA1	41	4.592	Other		
BUMA 2	9	918	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		11.953	Total Cargo from ROM		474
Delays	Mechanic				hrs
	Electric			0,58	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,33	hrs
Total Down Time				0,92	hrs
Total Effective Operating Time				11,08	hrs
Net Inloading Rates				1.141	tph

BARGE NAMES		TCP 3003	TCP 3002	L Mutiara	Total
Belt Scale CV-05	Start	3.481.506,0	3.482.735,0	3.490.505,0	
	Finish	3.482.735,0	3.490.505,0	3.495.005,0	
	Total belt scale	1.229,0	7.770,0	4.500,0	13.499,0
TOTAL DRAFT SURVEY		1.279,0	7.655,0	4.500,0	13.434,0
Delays	Mechanic				
	Electric				
	Operation	1,17			1,2
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting		0,50	0,33	0,8
	Empty Barge		0,83	1,67	2,5
Total Down Time		1,17	0,50	0,33	2,0
Total Operating Time		2,25	4,25	2,33	8,8
Total Effective Operating Time		1,08	3,75	2,00	6,8
Net Outloading rates		1.134	2.072	2.250	1.975

BARGES NAMES		L Mutiara	TCP 3003	TCP 3005	Total
Belt Scale CV-05	Start	**3.495.005,0**	**3.498.062,0**	**3.505.634,0**	**Total**
	Finish	**3.498.062,0**	**3.505.634,0**	**3.506.634,0**	
	Total belt scale	**3.057,0**	**7.572,0**	**1.000,0**	**11.629,0**
TOTAL DRAFT SURVEY		**3.174,0**	**7.505,0**	**1.000,0**	**11.679,0**
Delays	Mechanic				
	Electric				
	Operation	**1,00**			**1,0**
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	**0,17**	**0,50**		**0,7**
	Empty Barge		**2,42**	**2,67**	**5,1**
Total Down Time		**1,17**	**0,50**		**1,7**
Total Operating Time		**2,33**	**3,67**	**0,58**	**6,6**
Total Effective Operating Time		**1,17**	**3,17**	**0,58**	**4,9**
Net Outloading rates		**2.620**	**2.391**	**1.714**	**2.365**

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	14.310	1.431	11.474	1.513	25.784	1.466
Outloading-CV05	14.547	2.129	2.000	1.714	16.547	2.068
Inloading-TC	12.683	1.268	10.040	1.324	22.723	1.292
Outloading-DS	14.734	2.156	2.000	1.714	16.734	2.092

Belt Scale CV-01	start	47.511.460,0		112,8%	
	finish	47.525.770,0		14.310,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	21	1.155	PMR 7 3051		
PMR 2	20	1.020	BUMA LDR		
PMR 3			DMP L220		
PMR 4	51	4.692	PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	41	4.592	Other		
BUMA 2	12	1.224	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		12.683	Total Cargo from ROM		
Delays	Mechanic			0,50	hrs
	Electric			0,50	hrs
	Operation				hrs
	Metal Detector			0,17	hrs
	Other (specify)				hrs
	Dump Hopper Empty			0,83	hrs
Total Down Time				2,00	hrs
Total Effective Operating Time				10,00	hrs
Net Inloading Rates				1.431	tph

Belt Scale CV-01	start	47.525.770,0		114,3%	
	finish	47.537.244,0		11.474,0	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	**16**	**880**	PMR 7 3051		
PMR 2	**18**	**918**	BUMA LDR		
PMR 3			DMP L220		
PMR 4	**37**	**3.404**	PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	**35**	**3.920**	Other		
BUMA 2	**9**	**918**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**10.040**	Total Cargo from ROM		
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	**OP8**		**4,17**	hrs
	Dump Hopper Empty			**0,25**	hrs
Total Down Time				**4,42**	hrs
Total Effective Operating Time				**7,58**	hrs
Net Inloading Rates				**1.513**	tph

BARGE NAMES		**TCP 3005**	**I. Mutiara**		**Total**
Belt Scale CV-05	Start	**3.506.634,0**	**3.513.480,0**	**3.521.181,0**	
	Finish	**3.513.480,0**	**3.521.181,0**	**3.521.181,0**	
	Total belt scale	**6.846,0**	**7.701,0**		**14.547,0**
TOTAL DRAFT SURVEY		**6.894,0**	**7.840,0**		**14.734,0**
Delays	Mechanic				
	Electric		**0,58**		**0,6**
	Operation	**0,50**			**0,5**
	Metal detector	**0,58**			**0,6**
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	**0,33**	**0,50**		**0,8**
	Empty Barge		**2,25**	**0,33**	**2,6**
Total Down Time		**1,42**	**1,08**		**2,5**
Total Operating Time		**4,42**	**4,92**		**9,3**
Total Effective Operating Time		**3,00**	**3,83**		**6,8**
Net Outloading rates		**2.282**	**2.009**		**2.129**

BARGES NAMES				TCP 3002	Total
Belt Scale CV-05	Start	**3.521.181,0**	**3.521.181,0**	**3.521.181,0**	
	Finish	**3.521.181,0**	**3.521.181,0**	**3.523.181,0**	
	Total belt scale			**2.000,0**	**2.000,0**
TOTAL DRAFT SURVEY				**2.000,0**	**2.000,0**
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge		**10,33**		**10,3**
Total Down Time					
Total Operating Time				**1,17**	**1,2**
Total Effective Operating Time				**1,17**	**1,2**
Net Outloading rates				**1.714**	**1.714**

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	14.671	1.397	13.185	1.507	27.856	1.447
Outloading-CV05	14.316	1.808	13.727	2.167	28.043	1.968
Inloading-TC	12.790	1.218	12.425	1.420	25.215	1.310
Outloading-DS	14.429	1.823	14.202	2.242	28.631	2.009

Belt Scale CV-01	start	47.537.244,0		114,7%	
	finish	47.551.915,0		14.671,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	24	1.320	PMR 7 3051		
PMR 2	11	561	BUMA LDR		
PMR 3			DMP L220		
PMR 4	51	4.692	PMR 1 (Biru)	17	595
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	42	4.704	Other		
BUMA 2	9	918	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		12.195	Total Cargo from ROM		595
Delays	Mechanic				hrs
	Electric			0,92	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	OP8		0,17	hrs
	Dump Hopper Empty			0,42	hrs
Total Down Time				1,50	hrs
Total Effective Operating Time				10,50	hrs
Net Inloading Rates				1.397	tph

Belt Scale CV-01	start	47.551.915,0		106,1%	
	finish	47.565.100,0		13.185,0	
PIT		TONNES	ROM PAD		TONNES
PMR 1	11	605	PMR 7 3051		
PMR 2	25	1.275	BUMA LDR	30	180
PMR 3			DMP L220		
PMR 4	52	4.784	PMR 1 (Biru)	14	490
PMR 5			PMR 2	17	935
PMR 6			PMR 3 (Putih)		
BUMA1	28	3.136	Other		
BUMA 2	10	1.020	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		10.820	Total Cargo from ROM		1.605
Delays	Mechanic				hrs
	Electric			0,17	hrs
	Operation			0,92	hrs
	Metal Detector			0,17	hrs
	Other (specify)	OP5		1,83	hrs
	Dump Hopper Empty			0,17	hrs
Total Down Time				3,25	hrs
Total Effective Operating Time				8,75	hrs
Net Inloading Rates				1.507	tph

BARGE NAMES		TCP 3002	TCP 3005	Diamond 3002	Total
Belt Scale CV-05	Start	3.523.181,0	3.528.838,0	3.536.497,0	
	Finish	3.528.838,0	3.536.497,0	3.537.497,0	
	Total belt scale	5.657,0	7.659,0	1.000,0	14.316,0
TOTAL DRAFT SURVEY		5.692,0	7.737,0	1.000,0	14.429,0
Delays	Mechanic				
	Electric		1,00		1,0
	Operation	0,50			0,5
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,33	0,50		0,8
	Empty Barge		0,83	0,92	1,8
Total Down Time		0,83	1,50		2,3
Total Operating Time		4,17	5,58	0,50	10,3
Total Effective Operating Time		3,33	4,08	0,50	7,9
Net Outloading rates		1.697	1.876	2.000	1.808

BARGES NAMES		Diamond 3002	Diamond 3003		Total
Belt Scale CV-05	Start	3.537.497,0	3.543.780,0	3.551.224,0	
	Finish	3.543.780,0	3.551.224,0	3.551.224,0	
	Total belt scale	6.283,0	7.444,0		13.727,0
TOTAL DRAFT SURVEY		6.606,0	7.596,0		14.202,0
Delays	Mechanic				
	Electric	3,75			3,8
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting		0,50		0,5
	Empty Barge		1,17		
Total Down Time		3,75	0,50		4,3
Total Operating Time		6,50	4,08		10,6
Total Effective Operating Time		2,75	3,58		6,3
Net Outloading rates		2.285	2.077		2.167

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	14.725	1.402	13.934	1.467	28.659	1.433
Outloading-CV05	14.301	2.487	9.196	2.207	23.497	2.369
Inloading-TC	12.995	1.238	11.300	1.189	24.295	1.215
Outloading-DS	14.371	2.499	9.319	2.237	23.690	2.389

Belt Scale CV-01	start	47.565.100,0		113,3%	
	finish	47.579.825,0		14.725,0	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	16	880	PMR 7 3051		
PMR 2	15	765	BUMA LDR		
PMR 3			DMP L220		
PMR 4	47	4.324	PMR 1 (Biru)	22	770
PMR 5			PMR 2	18	990
PMR 6			PMR 3 (Putih)		
BUMA1	37	4.144	Other		
BUMA 2	11	1.122	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		11.235	Total Cargo from ROM		1.760
Delays	Mechanic				hrs
	Electric			1,00	hrs
	Operation			0,17	hrs
	Metal Detector				hrs
	Other (specify)			0,33	hrs
	Dump Hopper Empty				hrs
Total Down Time				1,50	hrs
Total Effective Operating Time				10,50	hrs
Net Inloading Rates				1.402	tph

Belt Scale CV-01	start	**47.579.825,0**		**123,3%**	
	finish	**47.593.759,0**		**13.934,0**	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	**10**	**550**	PMR 7 3051		
PMR 2	**18**	**918**	BUMA LDR		
PMR 3			DMP L220		
PMR 4	**40**	**3.680**	PMR 1 (Biru)	**12**	**420**
PMR 5			PMR 2	**12**	**660**
PMR 6			PMR 3 (Putih)		
BUMA1	**38**	**4.256**	Other		
BUMA 2	**8**	**816**	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		**10.220**	Total Cargo from ROM		**1.080**
Delays	Mechanic				hrs
	Electric			**1,50**	hrs
	Operation			**0,75**	hrs
	Metal Detector				hrs
	Other (specify)				hrs
	Dump Hopper Empty			**0,25**	hrs
Total Down Time				**2,50**	hrs
Total Effective Operating Time				**9,50**	hrs
Net Inloading Rates				**1.467**	tph

BARGE NAMES		**Diamond. C**	**TCP 3003**		
Belt Scale CV-05	Start	**3.551.224,0**	**3.558.925,0**	**3.565.525,0**	**Total**
	Finish	**3.558.925,0**	**3.565.525,0**	**3.565.525,0**	
	Total belt scale	**7.701,0**	**6.600,0**		**14.301,0**
TOTAL DRAFT SURVEY		**7.771,0**	**6.600,0**		**14.371,0**
Delays	Mechanic				
	Electric	**0,08**	**0,67**		**0,8**
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	**0,33**	**0,33**		**0,7**
	Empty Barge				
Total Down Time		**0,42**	**1,00**		**1,4**
Total Operating Time		**3,58**	**3,58**		**7,2**
Total Effective Operating Time		**3,17**	**2,58**		**5,8**
Net Outloading rates		**2.432**	**2.555**		**2.487**

BARGES NAMES		TCP 3003	TCP 3001		Total
Belt Scale CV-05	Start	3.565.525,0	3.566.816,0	3.574.721,0	
	Finish	3.566.816,0	3.574.721,0	3.574.721,0	
	Total belt scale	1.291,0	7.905,0		9.196,0
TOTAL DRAFT SURVEY		1.367,0	7.952,0		9.319,0
Delays	Mechanic				
	Electric		1,83		1,8
	Operation	0,33			0,3
	Metal detector		0,25		0,3
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge			3,25	3,3
Total Down Time		0,33	2,08		2,4
Total Operating Time		1,33	5,25		6,6
Total Effective Operating Time		1,00	3,17		4,2
Net Outloading rates		1.291	2.496		2.207

Summary	Day Shift	Production Rate (tph)	Night Shift	Production Rate (tph)	Total Tonnes / day	Production Rate (tph)
Inloading-CV01	10.087	1.376			10.087	1.376
Outloading-CV05	7.758	2.165			7.758	2.165
Inloading-TC	9.540	1.301			9.540	1.301
Outloading-DS	7.876	2.198			7.876	2.198

Belt Scale CV-01	start	47.593.759,0		105,7%	
	finish	47.603.846,0		10.087,0	
PIT		**TONNES**	**ROM PAD**		**TONNES**
PMR 1	18	990	PMR 7 3051		
PMR 2	14	714	BUMA LDR	12	72
PMR 3			DMP L220		
PMR 4	41	3.772	PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1	32	3.584	Other		
BUMA 2	4	408	Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit		9.468	Total Cargo from ROM		72
Delays	Mechanic				hrs
	Electric			0,83	hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)			2,58	hrs
	Dump Hopper Empty			1,25	hrs
Total Down Time				4,67	hrs
Total Effective Operating Time				7,33	hrs
Net Inloading Rates				1.376	tph

Belt Scale CV-01	start	47.603.846,0			
	finish	47.603.846,0			
PIT		.-	ROM PAD		TONNES
PMR 1			PMR 7 3051		
PMR 2			BUMA LDR		
PMR 3			DMP L220		
PMR 4			PMR 1 (Biru)		
PMR 5			PMR 2		
PMR 6			PMR 3 (Putih)		
BUMA1			Other		
BUMA 2			Other		
Buma single vessel			Other		
Other			Other		
Other			Other		
Other			Other		
Total Cargo from Pit			Total Cargo from ROM		
Delays	Mechanic				hrs
	Electric				hrs
	Operation				hrs
	Metal Detector				hrs
	Other (specify)	OP8		12,00	hrs
	Dump Hopper Empty				hrs
Total Down Time				12,00	hrs
Total Effective Operating Time					hrs
Net Inloading Rates					tph

BARGE NAMES		Diamond 3002			Total
Belt Scale CV-05	Start	3.574.721,0	3.582.479,0	3.582.479,0	
	Finish	3.582.479,0	3.582.479,0	3.582.479,0	
	Total belt scale	7.758,0			7.758,0
TOTAL DRAFT SURVEY		7.876,0			7.876,0
Delays	Mechanic				
	Electric	0,83			0,8
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting	0,33			0,3
	Empty Barge	3,33	3,92		7,3
Total Down Time		1,17			1,2
Total Operating Time		4,75			4,8
Total Effective Operating Time		3,58			3,6
Net Outloading rates		2.165			2.165

BARGES NAMES					Total
Belt Scale CV-05	Start	**3.582.479,0**	**3.582.479,0**	**3.582.479,0**	
	Finish	**3.582.479,0**	**3.582.479,0**	**3.582.479,0**	
	Total belt scale				
TOTAL DRAFT SURVEY					
Delays	Mechanic				
	Electric				
	Operation				
	Metal detector				
	Weather				
	Waiting Cargo				
	Other				
	Barge Shifting				
	Empty Barge	**12,00**			**12,0**
Total Down Time					
Total Operating Time					
Total Effective Operating Time					
Net Outloading rates					

DAY	INLOAD BS CV01	CUM IN	OUTLOAD BS CV05	CUM OUT
1	29.919	29.919	23.225	23.225
2	33.660	63.579	30.883	54.108
3	33.266	96.845	31.697	85.805
4	30.047	126.892	31.853	117.658
5	28.167	155.059	30.304	147.962
6	31.439	186.498	15.199	163.161
7	28.800	215.298		
8	6.604	221.902	9.884	173.045
9	22.833	244.735	31.318	204.363
10	22.654	267.389	20.144	224.507
11	18.565	285.954	7.275	231.782
12			29.147	260.929
13	19.030	304.984	24.872	285.801
14	27.163	332.147	23.144	308.945
15	27.982	360.129	28.952	337.897
16	24.437	384.566	29.933	367.830
17	31.723	416.289	28.180	396.010
18	33.380	449.669	26.107	422.117
19	33.355	483.024	7.696	429.813
20	23.401	506.425	23.140	452.953
21	25.962	532.387	29.437	482.390
22	29.602	561.989	25.128	507.518
23	25.784	587.773	16.547	524.065
24	27.856	615.629	28.043	552.108
25	28.659	644.288	23.497	575.605
26	10.087	654.375	7.758	583.363
27				
28				
29				
30				
31				
TOTAL	**654.375**		**583.363**	

Delay Code	
SM 1	Shutdown For Maintenance Inloading
	Genset Trip / Black Out / Service
OP1	Dump Hopper Empty
OP2	Metal Detector
OP3	Change Stacker
OP4	Uncrusahable Materials
OP5	Others delays in front of hopper
OP6	Others delays on Plant (waiting Coal
OP7	Survey Stokpile
OP8	Stockpile Full
OP9	Clean Up
OP10	Maked Space Stockpile
ME1	Inspeksi FB / Hopper
ME2	FB Blocked / Stuck
ME3	Sampling Plant Blocked / Problem
ME4	Sizer Blocked
ME5	Repair Bearing
ME6	Repair Pulley
ME7	Inspection & Repair Belt Conveyor
ME8	Repaire Chute
ME9	Repaire Gearbox
ME10	Change Roller
ME11	Repaire Skirt Plat /Rubber
EL1	SoftStater Fault / Drive Not Ready
EL2	Belt Drip
EL3	Belt Rip
EL4	Pull Wire Switch
EL5	Block Chute
EL6	Sampling Plant Blocked / Problem CV02
EL7	Take up Limit
EL8	Under Speed
EL9	Others
OT 1	Short Coal Haulages
OT 2	Community Strikes
OT 3	Coal Tipped to Overflow

Delay Code	
	Shutdown For Maintenance
	Genset Trip / Black Out
OP10	Operational Breakdown (include
OP11	Waiting Cargo
OP12	Metal Detector & Cek MD CV05
OP13	Weather
OP14	Barge Shifting
OP15	Empty Barge
OP16	Survey Stockpile
OP17	Clean Up
OP18	Waiting Quality
ME12	Inspeksi Reclaimer
ME13	Reclaimer Stuck
ME14	Sampling Plant Blocked / Problem
ME15	Repair Bearing
ME16	Repair Pulley
ME17	Repair Belt Conveyor
ME18	Repaire Chute
ME19	Repaire Gearbox
ME20	Change Roller
ME21	Repaire Skirt Plat /Rubber/baseplate
ME22	Others
EL1	SoftStater Fault / Drive Not Ready
EL2	Belt Drip
EL3	Belt Rip
EL4	Pull Wire Switch
EL5	Block Chute
EL6	Sampling Plant Blocked / Problem CV02
EL7	Take up Limit
EL8	Under Speed
EL9	VSD Fault / Breaker Trip
EL10	Others
OT1	Short Coal Haulages
OT2	Barge Grounded

Date		1	2	3	4	5	6	7	8	9	10
Shutdown For Maintenance		2,00	0,83								
Genset Trip / Black Out /							0,58				1,58
Operation	OP1	0,92	1,08	0,75	0,58	1,08	0,58	1,00	0,42	3,58	5,25
	OP2						0,17	0,17			
	OP3	0,17	0,17		0,17		0,33	0,67		0,33	
	OP4										
	OP5										
	OP6									1,33	
	OP7										
	OP8								18,33		
	OP9										
	OP10				0,33			2,08			
Total Delay											

Date		11	12	13	14	15	16	17	18	19	20
Shutdown For Maintenance			24,00	3,50							
Genset Trip / Black Out /				1,58	2,83	1,92	6,92	0,50	0,58	0,25	0,50
Operation	OP1	1,42		1,42	2,42		0,42	1,17	0,42	0,67	0,67
	OP2	0,33		0,17							
	OP3			0,17	0,17	0,17				0,17	
	OP4										
	OP5										
	OP6										
	OP7										
	OP8	7,17								0,67	5,33
	OP9										
	OP10								0,25		
Total Delay											

Date		21	22	23	24	25	26	27	28	29	30	31
Shutdown For Maintenance												
Genset Trip / Black Out /		0,75		0,50	0,92	2,50	0,83					
Operation	OP1	1,25	0,92	1,08	0,58	0,25	1,25					
	OP2			0,17	0,17							
	OP3	0,17	0,50		0,50	0,17						
	OP4											
	OP5				1,83							
	OP6											
	OP7											
	OP8			4,17	0,17		14,58	24,00	24,00			
	OP9											
	OP10					0,75						
Total Delay												

Date		1	2	3	4	5	6	7	8	9	10
Shutdown For Maintenance Out			1,50								
Genset Trip / Black Out											0,17
Operation	OP10		0,83	1,00			0,67			1,42	0,92
	OP11										
	OP12	0,42	0,17								
	OP13										
	OP14	0,50	1,00	1,17	1,50	1,33	0,42		0,17	0,92	0,25
	OP15	10,00	5,17	4,50	6,92	5,50	14,42	24,00	18,08	3,92	8,92
	OP16										
	OP17										
	OP18										

Date		11	12	13	14	15	16	17	18	19	20
Shutdown For Maintenance Out											
Genset Trip / Black Out				0,83	2,92	2,83			0,42	0,42	0,75
Operation	OP10			0,83	0,50	0,50		1,33	3,42		
	OP11										
	OP12			0,17		0,17		0,25	0,17	0,17	
	OP13										
	OP14	0,67	1,67	1,42	1,33	1,75	1,42	1,67	0,67	0,33	1,00
	OP15	18,75	7,25	5,33	3,67	5,08	3,75	4,92	5,50	14,00	10,58
	OP16										
	OP17										
	OP18										

Date		21	22	23	24	25	26	27	28	29	30	31	Total
Shutdown For Maintenance Out													1,50
Genset Trip / Black Out		0,42		0,58	1,00	2,58	0,83						13,75
Operation	OP10	1,08	2,17	0,50	0,50	0,33							16,00
	OP11												0,00
	OP12	0,25		0,58		0,25							2,58
	OP13												0,00
	OP14	1,33	1,50	0,83	1,33	0,67							24,83
	OP15	8,00	7,58	12,92	1,75	3,25	24,00	24,00					261,75
	OP16												0,00
	OP17												0,00
	OP18												0,00

AUTHOR BIOGRAPHY

Faishal Rachman was born in Cirebon, Jawa Barat, Indonesia on June 1, 1994 and the first of three children. He attended formal education in SDN Kramat 3 Cirebon, SMPN 5 Cirebon, SMAN 2 Cirebon and pursuing a bachelor degree in Marine Engineering at Institut Teknologi Sepuluh Nopember (ITS). At the time of college study, the author also participated in the Marine Engineering Students' Association at ITS (HIMASISKAL-ITS) as Head of the Strategic Division and selected as one of the exchange student in Kumamoto University, Japan at 2015 – 2016. The author had the opportunity to do research study in the RAMS (Reliability, Availability, Maintainability and Safety) laboratory. The author completed his undergraduate study in nine semesters.

Faishal Rachman
rachman.faishal@gmail.com